CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

>>
Chuanwei Group 24 MW Waste Gas based Captive Power Plant
Version number of the document: 06
Date: 05/08/2008

A.2. Description of the project activity:

>>
Chuanwei Group 24 MW waste gas based captive power plant (hereafter referred to as the Project) is sited within Lianjie Town, Weiyuan County, Neijiang City of Sichuan Province, P.R.China. The project activity involves installation of two sets of 12 MW condensing turbine generators. The objective of the Project is to utilize the waste gas of Chuanwei Group which would be flared in the absence of the Project to generate electricity, displacing part of electricity supplied by fossil fuel-fired power plants of the Central China Grid.

Being an environmentally sound project, the Project will not only supply carbon-free electricity by means of utilization of combustible waste gas, but also contribute to sustainable development of the local community, host country and the world by means of:

- reducing greenhouse gas emissions compared to a business-as-usual scenario;
- stimulating and accelerating the technology development of integrated resource utilization technologies and energy saving in steel industry.
- reducing the emission of other pollutants resulting from the power generation industry in China, compared to a business-as-usual scenario;
- creating 160 job opportunities during the project construction and operation period.

A.3. Project participants:

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Participants to the project activity are the following:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R.China (host)	Neijiang Xingming Energy Co.,Ltd. (Project owner)	No
The Netherlands	Energy Systems International B.V.	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

More detailed contact information on the Participants is provided in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

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The Host Country is the People’s Republic of China.

A.4.1.2. Region/State/Province etc.:

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Sichuan Province

A.4.1.3. City/Town/Community etc:

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Lianjie Town, Weiyuan County, Neijiang City

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

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The Project is sited within Lianjie Town, Weiyuan County, Neijiang City of Sichuan Province, P.R.China. The project site is to the south of the production area of Chuanwei Group and to the north of Chuanwei artificial forest. It is 41 km north-west to the Weiyuan County and 68 km east to the Renshou County. Figure 1 is a map showing the location of Neijiang City. Figure 2 is a map showing the location of the Project.

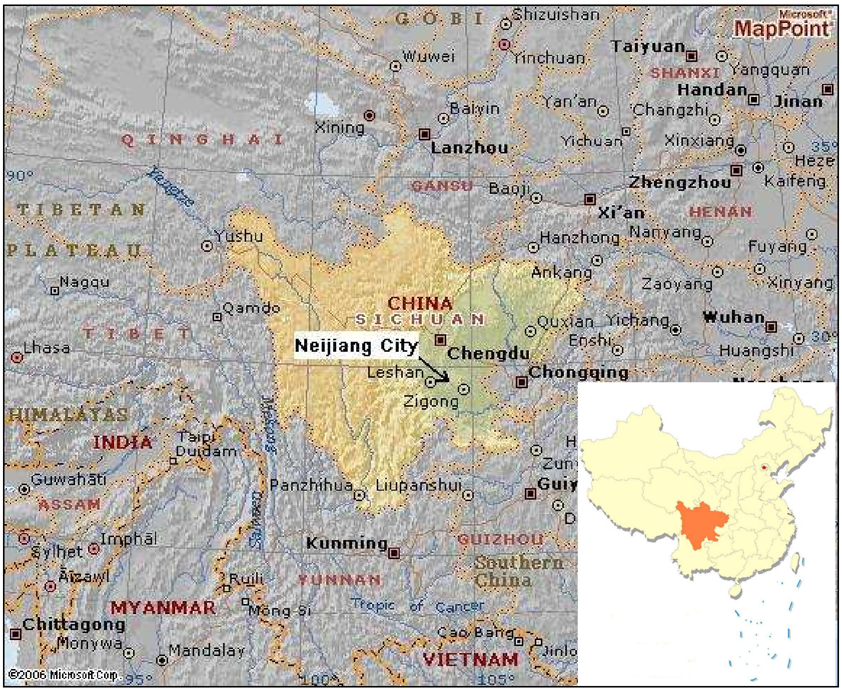

Figure 1. Location of Neijiang City

Figure 2. Location of the Project

A.4.2. Category(ies) of project activity:

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This category would fall within sectoral scope 1: energy industries.

A.4.3. Technology to be employed by the project activity:

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The project activity involves the installation of two sets of 12 MW condensing turbine generators which will combust 11.95×10^8 m^3 of blast furnace gas (hereafter referred to as BFG). The net electricity supply of the Project is estimated to be 190 GWh per year.

The project activity includes installation of two sets of turbines and boilers. The technology of combusting solely blast furnace gas patented by China's relevant agencies is applied to manufacture the boilers. Key technical indicators of the boiler, turbine and generator are listed in Table 1. All the boilers, turbines and generators are made in China. The implementation of the Project will demonstrate and promote the application of waste gas based power generation technology in China.

Table 1. Key technical indicators of the main equipments

Boiler	Turbine	Generator
Model type: CQ-75/3.82-Q Rated steam generation capacity: 75 t/h Rated steam pressure: 3.82 MPa Rated steam temperature: 450℃ Efficiency: 86.6% Combusting facility: BFG jet	Model type: N12-3.43/435 Type: Condensing turbine Rated power: 12 MW Rated rotation velocity: 3000 r/min Intake temperature: 435℃	Model type: QF1-12-2A Rated power: 12 MW Rated Voltage: 6300 V Rated rotation velocity: 3000 r/min

Technology employed by the Project belongs to the technologies promoted by the Ten Key Energy

Saving Program of the Eleventh Five Year Plan[1]. The Project involves no technology transfer from abroad.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

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Renewable crediting period is adopted for the Project. It is expected that the Project activities will generate emission reductions for about 183,021 tCO_2e per year over the first 7-year crediting period from 01/09/2008 to 31/08/2015.

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
2008[2]	183,021
2009	183,021
2010	183,021
2011	183,021
2012	183,021
2013	183,021
2014	183,021
Total estimated reductions (tonnes of CO_2e)	**1,281,147**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**183,021**

A.4.5. Public funding of the project activity:

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There is no public funding from Annex I Parties for this Project.

1 Notification by NDRC, MOST, Ministry of Finance, Ministry of Construction, General Administration of Quality Supervision, Inspection and Quarantine, State Environmental Protection Administration, Government Offices Administration of the State Council, Administration for Offices Directly under the Central Committee of Communist Party of China on releasing the approval on implementing the Ten Key Energy Saving Programme listed in the "Eleventh Five Year Plan". (http://www1.cei.gov.cn/rei/doc/DQZC/200608212199.htm.)
2 Calculation period for a natural year is from September 1st of that year to August 31st of the next year.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

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ACM0004.ver 02 – "Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation" and "Consolidated monitoring methodology for waste gas and/or heat and/or pressure for power generation".

ACM0002.ver 06 – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" and "Consolidated monitoring methodology for grid-connected electricity generation from renewable sources".

The *Tool for the Demonstration and Assessment of Additionality* ver 03.

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

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The consolidated methodology ACM0004 applies to project activities that generate electricity from waste heat or the combustion of waste gases in industrial facilities. The consolidated methodology ACM0004 applies to electricity generation project activities:

- that displace electricity generation with fossil fuels in the electricity grid or displace captive electricity generation from fossil fuels;

- where no fuel switch is done in the process, where the waste heat or pressure or the waste gas is produced, after the implementation of the project activity.

The Project is to displace electricity generation by fossil fuel-fired power plants in the Central China Grid, and no fuel switch activity is induced in the process in which the waste gas is generated after the implementation of the project activity, therefore the consolidated methodology ACM0004 is applicable to the Project.

According to the consolidated methodology ACM0004, the consolidated baseline methodology ACM0004 is applied in compliance with the consolidated monitoring methodology ACM0004, and the emission factor of baseline grid electricity displaced by net electricity supply of the Project is calculated as per ACM0002, the additionality of the Project is demonstrated and assessed by using the *Tool for the Demonstration and Assessment of Additionality* approved by CDM EB.

B.3. Description of the sources and gases included in the project boundary

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As per consolidated methodology ACM0004, the spatial extent of the project boundary comprises the waste gas sources, captive power generating equipment and the power plants connected physically to the electricity grid that the proposed project activity will affect. According to the consolidated methodology ACM0004, the spatial scope of power system is determined to be the Central China Grid based on the consolidated baseline methodology ACM0002. With reference to the *Notification on Determining*

Baseline Emission Factor of China's Grid[3], the Central China Grid is composed of Henan Power Grid, Hubei Power Grid, Hunan Power Grid, Jiangxi Power Grid, Sichuan Power Grid and Chongqing Power Grid.

<table>
<tr><th></th><th>Source</th><th>Gas</th><th>Included?</th><th>Justification/Explanation</th></tr>
<tr><td rowspan="3">Baseline</td><td rowspan="3">Electricity generation of those fossil fuel-fired power plants connected into the Central China Grid.</td><td>CO_2</td><td>Yes</td><td>Main emission sources.</td></tr>
<tr><td>CH_4</td><td>No</td><td>Excluded for simplification. This is conservative.</td></tr>
<tr><td>N_2O</td><td>No</td><td>Excluded for simplification. This is conservative.</td></tr>
<tr><td rowspan="6">Project activity</td><td rowspan="3">On-site fossil fuel consumption due to the project activity.</td><td>CO_2</td><td>Yes</td><td>May be an important emission source, and will be calculated based on the fuel gas used.</td></tr>
<tr><td>CH_4</td><td>No</td><td>Excluded for simplification.</td></tr>
<tr><td>N_2O</td><td>No</td><td>Excluded for simplification.</td></tr>
<tr><td rowspan="3">Combustion of waste gas for electricity generation.</td><td>CO_2</td><td>No</td><td>BFG would have been burned in the baseline scenario.</td></tr>
<tr><td>CH_4</td><td>No</td><td>Excluded for simplification.</td></tr>
<tr><td>N_2O</td><td>No</td><td>Excluded for simplification.</td></tr>
</table>

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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As per the consolidated methodology ACM0004, the possible alternative scenarios in the absence of the CDM project activity would be as follows:

Alternative a. The proposed project activity not undertaken as a CDM project activity;

Alternative b. The current situation of surplus BFG being flared would continue and electricity would be provided by the grid;

Alternative c. Power generation by existing or new captive power plants on-site, using other energy sources than waste gas and/or heat and/or pressure, such as coal, diesel, natural gas, hydro, wind, etc;

Alternative d. A mix of options (b) and (c), in which case the ratio of power generation by the grid and the captive power plant should be specified;

Alternative e. Other uses of the waste gas.

According to the consolidated methodology, the project participant shall exclude baseline options that:

·do not comply with legal and regulatory requirements; or

·depend on key resources such as fuels, materials or technology that are not available at the project site.

Among the alternatives that do not face prohibitive barriers above, the most economically attractive alternative should be considered as the baseline scenario.

Detailed analysis of each possible alternative scenario above is listed below:

Alternative a (The Project were not undertaken as a CDM project activity) is feasible regarding key resources availability which meets all the legal and policy requirements in China.

3 Issued by China's DNA on 09/08/2007 on http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1889.

Alternative b (The current situation of surplus BFG being flared would continue and electricity would be provided by the grid) is a financially and technically feasible baseline scenario which meets all the legal and policy requirements in China.

Alternative c (Power generation by existing or new captive power plants on-site, using other energy sources than waste gas and/or heat and/or pressure, such as coal, diesel, natural gas, hydro, wind, etc) is not feasible for the following reasons:

·For coal-fired power generation project: the possible alternative baseline scenario of building a 24 MW coal-fired power plant is not feasible for: Considering the same annual electricity generation, the alternative baseline scenario for the Project should be a coal-fired power plant with installed capacity of about 24 MW. However, according to China's regulations, construction of coal-fired power plants with unit capacity of equal or less than 135 MW are prohibited in the areas which can be covered by large grids such as provincial grids[4]. For these reasons, the possible alternative baseline scenario of building a 24 MW coal-fired power plant conflicts with China's current regulations.

·For diesel or natural gas based power generation project: Prices of petroleum and natural gas are very high in China at present (about 2700 RMB[5] per ton of oil and 1.20~1.32 RMB per m^3 of natural gas[6]) and it is expected to be increased in the foreseeable future. Due to the increasing oil price, most oil fired power plants in China are losing money at present. Advice is given by professional institute that necessary cautions should be taken when construct diesel or natural gas based power plant.[7] Under this context, there is no incentive for the project owner to build diesel or natural gas based power project at the project site.

· For wind or hydro power generation project: There is no economic exploitable wind or hydro resource near the project site. Furthermore, hydropower or wind power resources cannot meet the production requirement of Chuanwei Group on stability of electricity supply.

Alternative d. (A mix of options (b) and (c), in which case the ratio of power generation by the grid and the captive power plant should be specified) is not feasible, since Alternative c is not feasible.

Alternative e. (Other uses of the waste heat and waste gas) is not feasible for the high toxicity, easy explosion and low caloric value of BFG. BFG is difficult to be utilized except for mixed combustion with high caloric value fuels on-site. However, the project owner has implemented several energy efficiency projects in the recent two years and recovered high/middle caloric value waste gases, such as COG and LD gas, to substitute part of BFG to satisfy the demand of process heat, which further reduces demand for BFG[8]. As a result, there leaves no possibility for Chuanwei Group to utilize surplus BFG in other methods except flare.

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4 *Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135 MW or Below* issued by the General Office of the State Council, decree no. 2002-6.
5 Http://www.sinopecnews.com.cn/info/2007-04/02/content_431349.htm.
6 Bureau of Commodity Price of Sichuan Province: http://www.scpi.gov.cn/newzcfg/zcfg-content.asp?id=1827, http://www.scpi.gov.cn/newzcfg/zcfg-content.asp?id=1996.
7 Http://www.sp.com.cn/dlyw/gndlyw/200602200017.htm.
8 Gas/Energy Balance Sheet of Chuanwei Group of 2005 and 2006.

As discussed above, only Alternative a (The Project was not undertaken as a CDM project activity) and Alternative b (The current situation of surplus BFG being flared would continue and electricity would be provided by the grid) needs further discussion regarding applicable laws and regulations.

Alternative a (The Project was not undertaken as a CDM project activity) is not feasible as it faces financing barriers and technological barrier as listed below:

Investment barrier

Chuanwei Group is one of the earliest iron and steel plants in China whose former, Weiyuan Plant, was established in 1929. In consideration of the issues related to security rather than resources, Lianjie Town, located in a remote mountainous area, was selected as the plant site. With the expansion of the production scale, lean ore of Lianjie Town could no longer satisfy the demand for raw materials since 1953, so the plant began to purchase iron ore on a large scale, which became a very big operational risk for its later operation and is still one of the key factors affecting the operation decisions of Chuanwei Group.

In 1997, Weiyuan Plant was hit hard by the Asian Financial Crisis, which resulted in a contracting market for iron and steel, and made Weiyuan Plant nearly bankrupted[9]. In 1998, Chuanwei Group was established by asset reorganization of Weiyuan Plant. From then on, the decision-makers of Chuanwei Group clearly recognize the business risks of iron and steel industry. For improving and enhancing the business competitiveness, most of the capital of the Chuanwei Group is invested into the key upstream projects that determine the production cost of iron and steel industry such as resource exploitation, e.g. coal, iron ore, limestone, etc, and related projects that can hedge the business risks of iron and steel industry, such as metalwork and deep processing, cement production, real estate, etc[10].

Under such circumstances, it is pointed out by the decision-makers of Chuanwei Group from the initial phase of the Project that the Project is not considered strategic and the needed investment should be financed outside the Chuanwei Group as much as possible.

However, iron and steel production output in China surpassed 200 millions since 2003. Either the production or the distribution of this industry began to develop much faster than before. This situation called for overall policy domination from central government. Under this status, Chinese government started to take action on iron and steel industry; it focuses on the potential industrial risks and drew out related regulations and policies to control the industry development. Therefore, working conference on economic issues held by the central government and No.47 standing conference of State Council have required that macro regulations be imposed on loans to industries such as steel industry[11], and NDRC[12] has also announced warnings on risks of surplus capacity of 11 industries including the steel industry[13];

9 http://news.sina.com.cn/c/2001-11-06/393491.html

10 The key investment fields would be mineral resources development and high added value new products, as is pointed out in the meeting minutes No. 8, 2004 of Chuanwei Group. The Project does not fall into the key investment fields. It is required not to occupy the Chuanwei Group's capital allocation while collect investment from outside financing, stock-holding and CDM.

11 Http://www.hnii.gov.cn/itlt1.asp?theid=2641.

12 National Development and Reform Committee.

13 Documents issued by bank have been submitted to DOE as evidence.

Under this policy storm, domestic banks also began to think about loan risks in China for iron and steel industry.

Since the financial institutions of China are generally unfamiliar with the economic analysis of energy efficiency investment projects, they usually hold conservative attitudes towards such projects and thus are reluctant to provide them with loans[14]. Prof. Dai Yande, vice director of the Energy Research Institute of NDRC and director of the WB/GEF[15] China Energy Efficiency Projects Promotion Office, considers that this phenomenon is related to the traditional opinions on investment development. Currently, commercial banks are inclined to provide capitals to those production capacity addition or expansion projects with clear cash flows, to which the existing procedures in respect of management, assessment methods, process implementation and so on can be easily applied, incurring low managerial and operational costs and entailing little effort to control relevant risks. However, investment on energy efficiency projects belongs to secondary investment, whose return does not come from increases in the production capacity expansion and sales revenues, but from decrease in the expenditures on enterprise energy consumption, which imposes more difficulties on the banks to have the accurate information on the cash flows of the projects. At present, banks do lack related experience on risk management as well as methods and mechanisms on management assessment regarding this type of project, which is conceived as the most serious barrier to the financing of energy saving projects by domestic commercial banks[16]. Mr. Xu Qiuwen, Representative of World Bank and Senior Executive Officer and Project Manager of Energy Efficiency Financing in China of International Finance Company, has pointed out that it is hard to get loans from banks for energy conservation projects in China[17]. Meanwhile Energy Conservation Information Dissemination Center of NDRC in the duration of implementing its *China Energy Conservation Financing Agency Mechanism Implementation Plan* has also pointed out that one of the reasons of the shortage of energy conservation investment lies in financing institutions' no knowledge on energy conservation and lack of necessary financing tools[18].

Therefore, domestic banks conduct rules and regulations to avoid loan risk on iron and steel industry. China Banking Regulatory Commission organized inspections in 2004 and 2005 on loans made by banks to steel industry[19]. In addition, banks implement strict control on loans made to steel industry, and ICBC even withdrew loans previously made[20].

At this moment, as an iron and steel company, influenced by the governmental and financial policy regulations, Chuanwei Group faces unprecedented difficulty in getting loans from banks under the circumstances. Under this situation, many proposed iron and steel projects by Chuanwei group have to be laid on the table.

For this project, in order to solve the financing problem faced by the Project, project specific stocks were issued within staff of the Chuanwei Group and meanwhile the equity investment was introduced from Neijiang Xingyuan Power Group. However, there currently still exists the capital shortage that the project owner is suffering from lack of financial channel, which forces the Project to cancel the

14 Http://www.realestate.gov.cn/default.asp?recordno=49185&line=111.
15 World Bank/Global Environment Facility.
16 Http://news.cepee.com/text.php?NewsId=13382.
17 Http://invest.jrj.com.cn/news/2007-04-04/000002120091.html.
18 Http://www.secidc.org.cn/newscontent.asp?id=116.
19 Http://www.mysteel.com/servlet/News.Detail?id=531227 and http://news.yonghua.net.cn/htmldata/2005_03/2/11/article_126308_1.html.
20 Http://finance.sina.com.cn/money/bank/bank_hydt/20060404/20372473902.shtml.

installation of coal gas tank[21] and delay the construction process of the Project, resulting great amounts of blast furnace gas having to continue to be flared.

Meanwhile, unfavorable opinion of commercial banks to energy efficiency projects also prevented the Project from obtaining enough loans from banks to continue the construction of the Project. The Project failed to loan in a local bank[22], which was a fatal barrier for the project owner to continue the project construction.

The price index in China keeps increasing from 1997 and reaches the highest increasing rate in 2004[23]. In June 2004, 32 million RMB equity had been arranged by the project owner and outside investment financing from both investors and local banks had been started. Although the financing issue of the Project was unsolved, to avoid the idling loss of capital and the risk of increase of material and employee cost, the project owner started construction preparation in June 2004 and tried their best to delay the payment of equipments. The evidences of delaying payment are provided as evidences. Without sufficient investment, the project owner had to cancel the installation of coal gas tank and prolong the construction process of the Project for almost 1 year. The construction period of the Project is from June 2004 to July 2006. While in the FSR, the planned construction period is only 1 year.

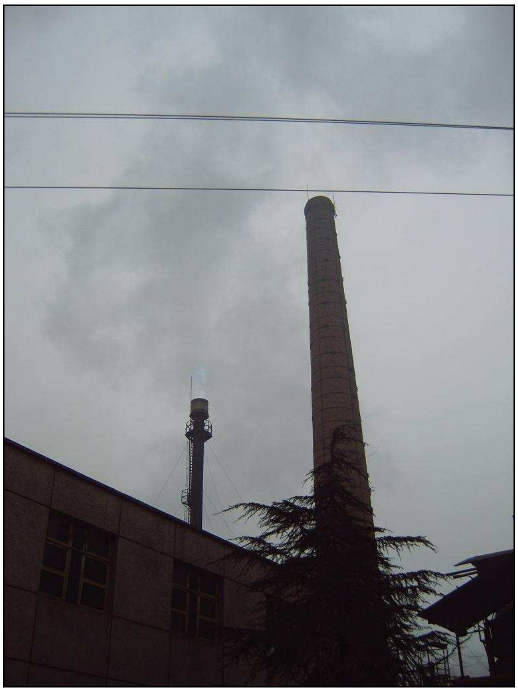

Figure 3. Flared BFG in Chuanwei Group

21 Niu Fu'an. Assessment methodology of BFG power generation project and its generalization prospects. Chinese Energy, 1999 (3): 9~11: "Setting up blast furnace gas tank can help ensure a stable supply of gas to promote stable combustion of gas in the boiler, and at the same time can help enhance the boiler's safe functioning. Consequently, power plants utilizing BFG to generate electricity generally ought to set up the corresponding blast furnace gas tank."
22 The Project is constructed totally by equity and fails to get any loan. Shanghai Pudong Development Bank's reasons for the rejection are insufficient mortgage, low return and long repayment period (The letter is provided to DOE for validation). In fact, most banks in China are reluctant to issue loans to such projects because of their incompetency to assess the risks in energy efficiency investment projects in iron and steel industry.
23 Http://www.people.com.cn/GB/shehui/1063/3064472.html.

Technological barrier

BFG is the by-product of blast furnace iron-making process, which is characterized by low caloric value, highly fluctuated output, high toxicity and great possibility of explosion. Currently, BFG is utilized primarily as ancillary fuel to hot blast stoves, coke oven, steam boiler, steel-rolling oven and so on[24]. Due to its low caloric value[25], BFG is generally mixed with other gases with high caloric value before being utilized, which to some extent affects the energy efficiency of gases with high caloric value, that is, BFG is applied as ancillary fuel at the expense of reducing energy efficiency of fuels with high caloric value[26]. Iron and steel producers will choose first to flare BFG in case of gas surplus[27].

The technology of combusting solely blast furnace gas in boilers is a patented one in China[28], which is now being demonstrated and popularized. The patented technology employed by the Project related to a boiler with high temperature and pressure for power plants combusting solely blast furnace gas, wherein the hearth is separated by the stays to a combustion chamber and an upper furnace. Further evidence can be found as the certification of the patented technology obtained from the China Patent Database of China Patent Information Center[29]. However, technological barriers have been encountered during the demonstration of the technology[30], including:

24 Wang Zhengmin. Reasonable utilization and energy saving potential of blast furnace gas. Chinese Energy, 1999 (1): 28~32; Huang Minkun, Peng Xiangyu. Study on steel company's plan of combined-cycle power generation utilizing BFG. Central China Electricity, 2001, 14(1): 14~17. Prof. Wang Zhenming is the Secretary-general of Commission for Thermal Electricity of China Society for Electrical Engineering.

25 At present, the caloric values of the combustible components of blast furnace gas of the Chuanwei Group are ranging from 2510~3340 kJ/m^3, which cannot even reach 1/10 of the caloric value of natural gas. Data source: Improve the BFG emission control capacity, optimize the utilization of BFG. Iron-Making Technology Letter, 2004 (2): 15~16.

26 Zhang Chuanxiu, Ni Xiaofeng. Social and economic benefits of power generation by BFG. Shanghai Metals, 2004, 26(4): 57~60.

27 Zhang Chuanxiu, Ni Xiaofeng. Social and economic benefits of power generation by BFG. Shanghai Metals, 2004, 26(4): 57~60; Zhang Qi, Cai Jiuju, Du Tao. Optimum utilization of gas system in incorporated business enterprise of iron and steel .Energy for Metallurgical Industry, 2005, 24(4): 9~12; Zhang Qi, Cai Jiuju, Du Tao. Integrated utilization of gas system in incorporated business enterprise of iron and steel. Proceeding of 2005 China Iron and Steel Conference, 536~540.

28 Wang Weixing. The process energy consumption and energy saving potential in iron and steel companies. Metallurgy Management, 2005(6):32~34. Prof. Wang Weixing is a senior engineer level professor of Chinese Society for Metals as described on the website of China Energy Conservation Supervision (http://www.cecs.gov.cn/cecsbbs/viewthread.php?action=printable&tid=66). Metallurgy Management was established in 1988 and published by China Metallurgical Industry Economic Development Research Centre. It is an industrial specialized periodical on metallurgy.

29 According to the information provided by the China Patent Database, this technology is developed by Yang Tianzhu, et al from China Shougang Group. The announcement date of this patent is 26/06/2002 with the announcement number of 1086788, which won the China National Golden Prize for Patents (Http://www.shougang.com.cn/news/pic/2752.html). A special design of hearth which is separated by the stays to a combustion chamber and an upper hearth is applied, wherein the combustion chamber is used to ensure the stable and complete combustion of the blast furnace gas and the upper hearth is used to absorb the combustion heat from the blast furnace gas. Yang Tianzhu is the founder of this technology and his paper is also referred to in the PDD to demonstrate the barriers when implementing the patented technology.

30 Lou Mabao. Utilization of Low NCV waste gas. Gas Turbine Technology, 2000, 13 (3): 16~18; Wang Hongtao, Cheng Yanling, Yang Tianzhu. Research of 220 t/ h high temperature and pressure plant boiler with combusting pure BFG. Energy Conservation Technology,2005, 3(5):422-425.

·Low theoretical combustion temperature: the theoretical combustion temperature of bituminous coal ranges between 1900~2100℃, even if BFG is preheated to 180℃, its theoretical combustion temperature can only reach approximately 1300℃. Due to lower combustion temperature, the capacity of flue gas generated by BFG is relatively weak, heat-transmission capacity of the flue gas when combusting BFG can be 59% lower than that when combusting bituminous coal.

·Large amount of flue gas leads to a series of changes in the convection heat transfer characteristics: compared with coal fired stove with the same load, flow of flue gas increases by 80%. Therefore, combusting BFG can result in the increasing volume and velocity of flue gas, and as convection heat transfer is positive to the 0.8 power of the velocity of flue gas, combusting BFG will definitely increase the heat-transmission intensity of convection heating surface, so if ordinary over-heaters are applied, creep deformation of steel pipes of the over-heaters may result, and even explosion of the pipes. Excessively high rate of fluidization of coal economizer may also occur, leading to separation of gas and water, increasing water resistance and even leading to stagnation, which might cause the crack of the pipes of coal economizer.

·Difficulties in both ignition and stable combustion: Low temperature of the flames, which include large amount of inert gases, results in reduced velocity of flame transmission. Therefore, more effective gas-air mixture measures have to be taken when arranging combustion so as to ensure the complete and stable combustion of combustible components in the BFG, such as CO. In order to ensure the stable combustion in the boiler, apart from selecting proper burners, the type of hearth structure must be specially designed to separate combustion area and major heat-absorbing area, which can help ensure the local high temperature and accordingly the stable combustion of blast furnace gas.

Facing significant technological barrier, the pure BFG based power generation technology had been a new technology at least until 2006. It is listed as one of the key technologies in *Regulations on the Ten Major Categories of Energy-saving Projects during the Eleventh Five-year Plan* (FGHZ[2006] No.1457) issued by the National Development and Reform Commission on 25th Jul., 2006[31].

Moreover, Electricity generation projects utilizing BFG impose comparatively high requirements for the management and technical staff, who should grasp not only technologies of electricity project operation, but also comprehensive safety & protection techniques. More instruments are required to monitor the BFG leakage and to quickly cut off the BFG supply, and there is also need for training of the staff to master the application of these instruments. The great quantity of various instruments utilized in electricity generation by BFG also requires staff to grasp more knowledge related to electric operation than that required by ordinary electricity generation project.

The Project started construction in June 2004. There were more than 870 iron/steel plants in China in 2004[32] and only two among these plants employed this technology at that time according to publicly available data, they are

·50 MW Pure BFG Based Power Generation Project constructed by Shougang Group in Beijing in 1997;

31 Http://www.sdpc.gov.cn/hjbh/jnjs/W020060802557141103185.doc.
32 China Galaxy Securities Co., Ltd., *Iron and Steel Industry: to Improve the Giant Enterprises' Value by Resource Integration*, 5th Jun., 2007, http://www.firstmoney.com.cn/Article/UploadFiles/200706/20070620154931665.pdf.

·25 MW Pure BFG Based Power Generation Project constructed by Tangshan Iron and Steel Co., Ltd. in Tangshan City in 2000[33].
Since only two projects employed the pure BFG based power generation technology, the number of well trained operators was limited.

Furthermore, the pure BFG based power generation technology was invented by Shougang Group in Beijing in 1997 and implemented within and around Beijing. (Tangshan City is just about 200 km from Beijing.) However, Beijing and Tangshan City are about 2,000 km far from the project site, and the living standard of these areas is obviously higher than that of Neijiang City where the Project is located. Therefore, it is difficult to attract well trained operators from Beijing and Tangshan City to Neijiang City. The project owner had to try to overcome this barrier by training their own employees to adapt the new situations.

Staff of the Project is 70 persons most of whom were in the beginning designed to be composed of former laid-off-workers from iron and steel company. However, the project owner finally hired 33 graduates out of technological college and technology training school instead to undertake the operation of the Project since the former laid-off-workers don't possess enough technical knowledge required by power generation project. Even then, comprehensive and highly-intensive career training will be arranged for staff during operation period, which incurs additional investment and operation costs.

To summarize, Alternative a (The Project was not undertaken as a CDM project activity) is not feasible as it faces decision barrier, financing barrier and technological barrier. Alternative a (The Project was not undertaken as a CDM project activity) is not baseline scenario. For Alternative b (The current situation of surplus BFG being flared would continue and electricity would be provided by the grid), there exist no above identified barriers. The reliable and credible alternative available to the Project is Alternative b, i.e. the provision of equivalent amount of annual electricity supply by the Central China Grid.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

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The additionality of the Project is demonstrated and assessed by using the *Tool for the Demonstration and Assessment of Additionality* ver 03 approved by CDM EB.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

The objective of the Step 1 is to define realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps:

Sub-step 1a. Define alternatives to the project activity:

As per the consolidated methodology ACM0004, the possible alternative scenarios in the absence of the CDM project activity would be as follows:
Alternative a. The proposed project activity not undertaken as a CDM project activity;
Alternative b. The current situation of surplus BFG being flared would continue and electricity would be provided by the grid;

33 Http://www.jxcad.com.cn/simple/index.php?t556314.html.

Alternative c. Power generation by existing or new captive power plants on-site, using other energy sources than waste gas and/or heat and/or pressure, such as coal, diesel, natural gas, hydro, wind, etc;
Alternative d. A mix of options (b) and (c), in which case the ratio of power generation by the grid and the captive power plant should be specified;
Alternative e. Other uses of the waste gas.

According to the consolidated methodology, the project participant shall exclude baseline options that:

·do not comply with legal and regulatory requirements; or

·depend on key resources such as fuels, materials or technology that are not available at the project site.

Among the alternatives that do not face prohibitive barriers above, the most economically attractive alternative should be considered as the baseline scenario.

Detailed analysis of each possible alternative scenario above is listed below and in Sub-step 1b:

Alternative a (The Project not undertaken as a CDM project activity) is feasible regarding key resources availability.

Alternative b (The current situation of surplus BFG being flared would continue and electricity would be provided by the grid) is a financially and technically feasible baseline scenario.

Alternative c (Power generation by existing or new captive power plants on-site, using other energy sources than waste gas and/or heat and/or pressure, such as coal, diesel, natural gas, hydro, wind, etc) is not feasible for there is no other energy sources than waste gas and/or heat and/or pressure power plant and it is impossible to build new power generation project based on coal, diesel, natural gas, hydro or wind at the project site for the following reasons:

·For coal-fired power generation project: As analysed in Sub-Step 1b, the possible alternative baseline scenario of building a 24 MW coal-fired power plant conflicts with China's current regulations.

·For diesel or natural gas based power generation project: Prices of petroleum and natural gas are very high in China at present (about 2700 RMB[34] per ton of oil and 1.20~1.32 RMB per m^3 of natural gas[35]) and it is expected to be increased in the foreseeable future. Due to the increasing oil price, most oil fired power plants in China are losing money at present. Advice is given by professional institute that necessary cautions should be taken when construct diesel or natural gas based power plant.[36] Under this context, there is no incentive for the project owner to build diesel or natural gas based power project at the project site.

· For wind or hydro power generation project: There is no economic exploitable wind or hydro resource near the project site. Furthermore, hydropower or wind power resources cannot meet the production requirement of Chuanwei Group on stability of electricity supply.

34 Http://www.sinopecnews.com.cn/info/2007-04/02/content_431349.htm.
35 Bureau of Commodity Price of Sichuan Province: http://www.scpi.gov.cn/newzcfg/zcfg-content.asp?id=1827, http://www.scpi.gov.cn/newzcfg/zcfg-content.asp?id=1996.
36 Http://www.sp.com.cn/dlyw/gndlyw/200602200017.htm.

Alternative d. (A mix of options (b) and (c), in which case the ratio of power generation by the grid and the captive power plant should be specified) is not feasible, since Alternative c is not feasible.

Alternative e. (Other uses of the waste heat and waste gas) is not feasible for the high toxicity, easy explosion and low caloric value of BFG. BFG is difficult to be utilized except for mixed combustion with high caloric value fuels on-site. However, the project owner has implemented several energy efficiency projects in the recent two years and recovered high/middle caloric value waste gases, such as COG and LD gas, to substitute part of BFG to satisfy the demand of process heat, which further reduces demand for BFG. As a result, there leaves no possibility for Chuanwei Group to utilize surplus BFG in other methods except flare.

As discussed above, only Alternative a (The Project was not undertaken as a CDM project activity) and Alternative b (The current situation of surplus BFG being flared would continue and electricity would be provided by the grid) needs further discussion regarding applicable laws and regulations.

Sub-step 1b. Enforcement of applicable laws and regulations:

Alternative a (The proposed project activity not undertaken as a CDM project activity) meets all the legal and policy requirements in China.

Alternative b (Import of electricity from the grid) meets all the legal and policy requirements in China.

Alternative c (Power generation by existing or new captive power plants on-site, using other energy sources than waste gas and/or heat and/or pressure, such as coal, diesel, natural gas, hydro, wind, etc) is not feasible for: Considering the same annual electricity generation, the alternative baseline scenario for the Project should be a coal-fired power plant with installed capacity of about 24 MW. However, according to China's regulations, construction of coal-fired power plants with capacity of equal or less than 135 MW are prohibited in the areas which can be covered by large grids such as provincial grids[37]. For these reasons, the possible alternative baseline scenario of building a 24 MW coal-fired power plant conflicts with China's current regulations and building power plant using other energy is impossible regarding resources availability as discussed in Sub-step 1a.

Outcome of Step 1b
As discussed above, only Alternative a (The Project was not undertaken as a CDM project activity) and Alternative b (The current situation of surplus BFG being flared would continue and electricity would be provided by the grid) needs further discussion regarding barriers.

Step 3. Barrier analysis
This step is used to determine whether the proposed project activity faces real barriers that:
(a) Prevent the implementation of this type of proposed project activity; and
(b) Do not prevent the implementation of at least one of the alternatives.

Step 3 is carried out in the following sub-steps:

Sub-step 3a. Identify barriers that would prevent the implementation of this type of proposed project activity:

37 *Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135 MW or Below* issued by the General Office of the State Council, decree no. 2002-6.

Establish that there are barriers that would prevent the implementation of the project activity if the project activity was not registered as a CDM activity.

Investment barrier

Chuanwei Group is one of the earliest iron and steel plants in China whose former, Weiyuan Plant, was established in 1929. In consideration of the issues related to security rather than resources, Lianjie Town, located in a remote mountainous area, was selected as the plant site. With the expansion of the production scale, lean ore of Lianjie Town could no longer satisfy the demand for raw materials since 1953, so the plant began to purchase iron ore on a large scale, which became a very big operational risk for its later operation and is still one of the key factors affecting the operation decisions of Chuanwei Group.

In 1997, Weiyuan Plant was hit hard by the Asian Financial Crisis, which resulted in a contracting market for iron and steel, and made Weiyuan Plant nearly bankrupted38. In 1998, Chuanwei Group was established by asset reorganization of Weiyuan Plant. From then on, the decision-makers of Chuanwei Group clearly recognize the business risks of iron and steel industry. For improving and enhancing the business competitiveness, most of the capital of the Chuanwei Group is invested into the key upstream projects that determine the production cost of iron and steel industry such as resource exploitation, e.g. coal, iron ore, limestone, etc, and related projects that can hedge the business risks of iron and steel industry, such as metalwork and deep processing, cement production, real estate, etc[39].

Under the circumstances, it is pointed out by decision maker of Chuanwei Group from initial phase of the Project that it is not considered strategic and the investment of the Project should be financed outside the Chuanwei Group as much as possible.

However since 2003, iron and steel production output surpass 200 millions in China, either the production or the distribution of this industrial began to develop much faster than previous. This situation called for overall policy domination from central government. Under this status, Chinese government started to take action on iron and steel industry; it focuses on the potential industrial risks and drew out related regulation and policy to control the industrial development. Therefore, working conference on economic issues held by the central government and No.47 standing conference of State Council have required that macro regulations be imposed on loans to industries such as steel industry[40], and NDRC has also announced warnings on risks of surplus capacity of 11 industries including the steel industry[41];

Under this policy storm, domestic banks also began to think about loan risks in China for iron and steel industry.

Since the financial institutions of China are generally unfamiliar with the economic analysis of energy efficiency investment projects, they usually hold conservative attitudes towards such projects and thus

38 http://news.sina.com.cn/c/2001-11-06/393491.html
39 The key investment fields would be mineral resources development and high added value new products, as is pointed out in the meeting minutes No. 8, 2004 of Chuanwei Group. The Project does not fall into the key investment fields. It is required not to occupy the Chuanwei Group's capital allocation while collect investment from outside financing, stock-holding and CDM.
40 Http://www.hnii.gov.cn/itlt1.asp?theid=2641.
41 Documents issued by bank have been submitted to DOE as evidence.

are reluctant to provide them with loans[42]. Prof. Dai Yande, vice director of the Energy Research Institute of NDRC and director of the World Bank/GEF China Energy Efficiency Projects Promotion Office, considers that this phenomenon is related to the traditional opinions on investment development. Currently, commercial banks are inclined to provide capitals to those production capacity addition or expansion projects with clear cash flows, to which the existing procedures in respect of management, assessment methods, process implementation and so on can be easily applied, incurring low managerial and operational costs and entailing little effort to control relevant risks. However, investment on energy efficiency projects belongs to secondary investment, whose return does not come from increases in the production capacity expansion and sales revenues, but from decrease in the expenditures on enterprise energy consumption, which imposes more difficulties on the banks to have the accurate information on the cash flows of the projects. At present, the banks do lack related experience on risk management as well as methods and mechanisms on management assessment regarding this type of project, which is conceived as the most serious barrier to the financing of energy-saving projects by domestic commercial banks[43]. Mr. Xu Qiuwen, Representative of World Bank and Senior Executive Officer and Project Manager of Energy Efficiency Financing in China of International Finance Company, has pointed out that it is hard to get loan from bank for energy conservation project in China[44]. Meanwhile Energy Conservation Information Dissemination Center of National Development and Reform Commission in the duration of implementing its *China Energy Conservation Financing Agency Mechanism Implementation Plan* has also pointed out that one of the reasons of the shortage of energy conservation investment lies in financing institutions' no knowledge on energy conservation and lack of necessary financing tools[45].

Therefore, domestic banks conduct rule and regulation to avoid loan risk on iron and steel industry. China Banking Regulatory Commission organized inspections in 2004 and 2005 on loans made by banks to steel industry[46].In addition, banks implement strict control on loans made to steel industry, and ICBC even withdrew loans previously made[47].

At this moment, as an iron and steel company, influenced by the governmental and financial policy regulation, Chuanwei Group faces unprecedented difficulty in getting loan from bank under the circumstances. Under this situation, many proposed iron and steel project by Chuanwei group had to be laid on the table.

For this project, in order to solve the financing problem faced by the Project, project-specific stocks were issued within staff of the Chuanwei Group and meanwhile equity investment introduced from Neijiang Xingyuan Power Group. However, there currently still exists the capital shortage that the project owner is suffering of lack of financial channel, which forces the Project to cancel the installation of coal gas tank[48], and delayed the construction process of the Project, resulting great amounts of blast furnace gas having to continue to be flared.

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42 Http://www.realestate.gov.cn/default.asp?recordno=49185&line=111.

43 Http://news.cepee.com/text.php?NewsId=13382.

44 Http://invest.jrj.com.cn/news/2007-04-04/000002120091.html.

45 Http://www.secidc.org.cn/newscontent.asp?id=116.

46 Http://www.mysteel.com/servlet/News.Detail?id=531227 and http://news.yonghua.net.cn/htmldata/2005_03/2/11/article_126308_1.html.

47 Http://finance.sina.com.cn/money/bank/bank_hydt/20060404/20372473902.shtml.

48 Niu Fu'an. Assessment methodology of BFG power generation project and its generalization prospects. Chinese Energy, 1999 (3): 9~11: "Setting up blast furnace gas tank can help ensure a stable supply of gas to promote stable combustion of gas in the boiler, and at the same time can help enhance the boiler's safe functioning. Consequently,

Meanwhile, unfavorable opinion of commercial banks to energy efficiency projects also prevented the Project from obtaining enough loans from banks to continue the construction of the Project. The project failed to loan in local bank[49], which was a fatal barrier for the project owner to continue the project construction.

The price index in China keeps increasing from 1997 and reaches the highest increasing rate in 2004[50]. In June 2004, 32 million RMB equity had been arranged by the project owner and outside investment financing from both investors and local banks had been started. Although the financing issue of the Project was unsolved, to avoid the idling loss of capital and the risk of increase of material and employee cost, the project owner started construction preparation in June 2004 and tried their best to delay the payment of equipments. The evidences of delaying payment are provided as evidences. Without sufficient investment, the project owner had to cancel the installation of coal gas tank and prolong the construction process of the Project for almost 1 year. The construction period of the Project is from June 2004 to July 2006. While in the FSR, the planned construction period is only 1 year.

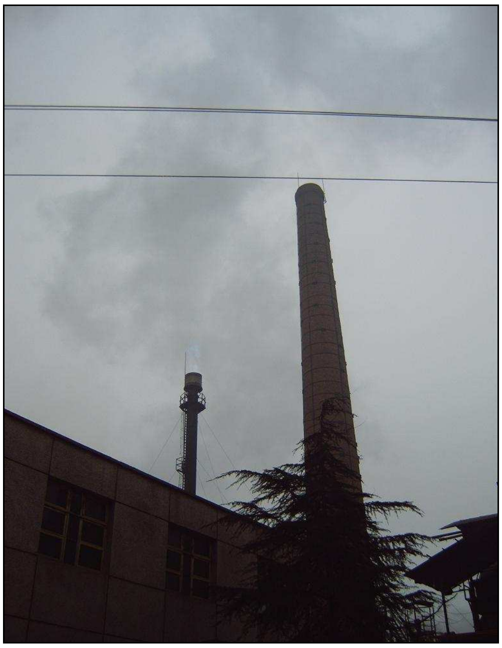

Figure 4. Flared BFG in Chuanwei Group

Technological barrier

BFG is the by-product of blast furnace iron-making process, which is characterized by low caloric value, highly fluctuated output, high toxicity and great possibility of explosion. Currently, BFG is utilized

power plants utilizing BFG to generate electricity generally ought to set up the corresponding blast furnace gas tank."

49 The Project is constructed fully with equity and fails to get any loan. Shanghai Pudong Development Bank's reasons for the rejection are insufficient mortgage, low return and long repayment period (The letter is provided to DOE for validation). In fact, most banks in China are reluctant to issue loans to such projects because of their incompetency to assess the risks in energy efficiency investment projects in iron and steel industry.

50 Http://www.people.com.cn/GB/shehui/1063/3064472.html.

primarily as ancillary fuel to hot blast stoves, coke oven, steam boiler, steel-rolling oven and so on[51]. Due to its low caloric value[52], BFG is generally mixed with other gases with high caloric value before being utilized, which to some extent affects the energy efficiency of gases with high caloric value, that is, BFG is applied as ancillary fuel at the expense of reducing energy efficiency of fuels with high caloric value[53]. Iron and steel producers will choose first to flare BFG in case of gas surplus[54].

The technology of combusting solely blast furnace gas in boilers is a patented one in China[55], which is now being demonstrated and popularized. The patented technology employed by the Project related to a boiler with high temperature and pressure for power plants combusting solely blast furnace gas, wherein the hearth is separated by the stays to a combustion chamber and an upper furnace. Further evidence can be found as the certification of the patented technology obtained from the China Patent Database of China Patent Information Center[56]. However, technical barriers have been encountered during the demonstration of the technology[57], including:

·Low theoretical combustion temperature: the theoretical combustion temperature of bituminous coal ranges between 1900~2100□, even if BFG is preheated to 180□, its theoretical combustion temperature can only reach approximately 1300□. Due to lower combustion temperature, the capacity of flue gas

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51 Wang Zhengmin. Reasonable utilization and energy saving potential of blast furnace gas. Chinese Energy, 1999 (1): 28~32; Huang Minkun, Peng Xiangyu. Study on steel company's plan of combined-cycle power generation utilizing BFG. Central China Electricity, 2001, 14(1): 14~17. Prof. Wang Zhenming is Secretary-general of Commission for Thermal Electricity of China Society for Electrical Engineering.

52 At present, the caloric values of the combustible components of blast furnace gas of the Chuanwei Group are ranging from 2510~3340 kJ/m^3, which cannot even reach 1/10 of the caloric value of natural gas. Data source: Improve the BFG emission control capacity, optimize the utilization of BFG. Iron-Making Technology Letter, 2004 (2): 15~16.

53 Zhang Chuanxiu, Ni Xiaofeng. Social and economic benefits of power generation by BFG. Shanghai Metals, 2004, 26(4): 57~60.

54 Zhang Chuanxiu, Ni Xiaofeng. Social and economic benefits of power generation by BFG. Shanghai Metals, 2004, 26(4): 57~60; Zhang Qi, Cai Jiuju, Du Tao. Optimum utilization of gas system in incorporated business enterprise of iron and steel .Energy for Metallurgical Industry, 2005, 24(4): 9~12; Zhang Qi, Cai Jiuju, Du Tao. Integrated utilization of gas system in incorporated business enterprise of iron and steel. Proceeding of 2005 China Iron and Steel Conference, 536~540.

55 Wang Weixing. The process energy consumption and energy saving potential in Iron and steel Companies. Metallurgy Management, 2005(6):32~34. Prof. Wang Weixing is a senior engineer level professor of Chinese Society for Metals as described on the website of China Energy Conservation Supervision (http://www.cecs.gov.cn/cecsbbs/viewthread.php?action=printable&tid=66). Metallurgy Management was established in 1988 and published by China Metallurgical Industry Economic Development Research Centre. It is an industrial specialized periodical on metallurgical.

56 According to the information provided by the China Patent Database, this technology is developed by Yang Tianzhu, et al from China Shougang Group. The announcement date of this patent is 26/06/2002 with the announcement number of 1086788, which won the China National Golden Prize for Patents (Http://www.shougang.com.cn/news/pic/2752.html). A special design of hearth which is separated by the stays to a combustion chamber and an upper hearth is applied, wherein the combustion chamber is used to ensure the stable and complete combustion of the blast furnace gas and the upper hearth is used to absorb the combustion heat from the blast furnace gas. Yang Tianzhu is the founder of this technology and his paper is also referred to in the PDD to demonstrate the barriers when implementing the patented technology.

57 Lou Mabao. Utilization of Low NCV waste gas. Gas Turbine Technology, 2000, 13 (3): 16~18; Wang Hongtao, Cheng Yanling, Yang Tianzhu. Research of 220 t/ h high temperature and pressure plant boiler with combusting pure BFG. Energy Conservation Technology,2005, 3(5):422-425.

generated by BFG is relatively weak, heat-transmission capacity of the flue gas when combusting BFG can be 59% lower than that when combusting bituminous coal.

·Large amount of flue gas leads to a series of changes in the convection heat transfer characteristics: compared with coal-fired stove with the same load, flow of flue gas increases by 80%. Therefore, combusting BFG can result in the increasing volume and velocity of flue gas, and as convection heat transfer is positive to the 0.8 power of the velocity of flue gas, combusting BFG will definitely increase the heat-transmission intensity of convection heating surface, so if ordinary over-heaters are applied, creep deformation of steel pipes of the over-heaters may result, and even explosion of the pipes. Excessively high rate of fluidization of coal economizer may also occur, leading to separation of gas and water, increasing water resistance and even leading to stagnation, which might cause the crack of the pipes of coal economizer.

·Difficulties in both ignition and stable combustion: Low temperature of the flames, which include large amount of inert gases, results in reduced velocity of flame transmission. Therefore, more effective gas-air mixture measures have to be taken when arranging combustion so as to ensure the complete and stable combustion of combustible components in the BFG, such as CO, etc. In order to ensure the stable combustion in the boiler, apart from selecting proper burners, the type of hearth structure must be specially designed to separate combustion area and major heat-absorbing area, which can help ensure the local high temperature and accordingly the stable combustion of blast furnace gas.

Facing significant technological barrier, the pure BFG based power generation technology had been a new technology at least until 2006. It is listed as one of the key technologies in *Regulations on the Ten Major Categories of Energy-saving Projects during the Eleventh Five-year Plan* (FGHZ[2006] No.1457) issued by the National Development and Reform Commission on 25th Jul., 2006[58].

Moreover, Electricity generation projects utilizing BFG impose comparatively high requirements for the management and technical staff, who should grasp not only technologies of electricity project operation, but also comprehensive safety & protection techniques. More instruments are required to monitor the BFG leakage and to quickly cut off the BFG supply, and there is also need for training of the staff to master the application of these instruments. The great quantity of various instruments utilized in electricity generation by BFG also requires staff to grasp more knowledge related to electric operation than that required by ordinary electricity generation project. Staff of the Project is 70 persons most of whom were in the beginning designed to be composed of former laid-off-workers from iron and steel company. However, the project owner finally hired 33 graduates out of technological college and technology training school instead to undertake the operation of the Project since the former laid-off-workers don’t possess enough technical knowledge required by power generation project. And 6 of the laid-off-workers hired by the Project are arranged in non technical position. Even then, comprehensive and highly-intensive career training will be arranged for staff during operation period, which incurs additional investment and operation costs.

The Project started construction in June 2004. There were more than 870 iron/steel plants in China in 2004[59] and only two among these plants employed this technology at that time according to publicly available data, they are

58 Http://www.sdpc.gov.cn/hjbh/jnjs/W020060802557141103185.doc.

59 China Galaxy Securities Co., Ltd., *Iron and Steel Industry: to Improve the Giant Enterprises’ Value by Resource Integration*, 5th Jun., 2007, http://www.firstmoney.com.cn/Article/UploadFiles/200706/20070620154931665.pdf.

·50 MW Pure BFG Based Power Generation Project constructed by Shougang Group in Beijing in 1997;

·25 MW Pure BFG Based Power Generation Project constructed by Tangshan Iron and Steel Co., Ltd. in Tangshan City in 2000[60].
Since only two projects employed the pure BFG based power generation technology, the number of well trained operators was limited.

Furthermore, the pure BFG based power generation technology was invented by Shougang Group in Beijing in 1997 and implemented within and around Beijing. (Tangshan City is just about 200 km from Beijing.) However, Beijing and Tangshan City are about 2,000 km far from the project site, and the living standard of these areas is obviously higher than that of Neijiang City where the Project is located. Therefore, it is difficult to attract well trained operators from Beijing and Tangshan City to Neijiang City. The project owner had to try to overcome this barrier by training their own employees to adapt the new situations.

Staff of the Project is 70 persons most of whom were in the beginning designed to be composed of former laid-off-workers from iron and steel company. However, the project owner finally hired 33 graduates out of technological college and technology training school instead to undertake the operation of the Project since the former laid-off-workers don't possess enough technical knowledge required by power generation project. Even then, comprehensive and highly-intensive career training will be arranged for staff during operation period, which incurs additional investment and operation costs.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

As mentioned in Step 1, the reliable and credible alternative available to the proposed project is Alternative b, i.e. import electricity from grid. The electricity will be supplied by commercially operated coal fired power plant of the Central China Grid. For Alternative b, there exist no above identified barriers.

To summarize, the project faces prohibitive investment barrier and technological barrier.

Step 4 Common practice analysis

Sub-step 4a. Analyze other activities similar to the project activity:

The waste gas based power generation technology by combusting solely blast furnace gas in boilers adopted in the Project is in phase of demonstration in China. Activities similar to the Projects are identified as BFG power generation projects located in similar iron & steel enterprises, where similar iron & steel enterprises are identified as iron & steel enterprises 1) within the same region, 2) with the same company ownership characteristic and 3) with the similar production scale to the project owner (Chuanwei Group).

As required by ACM0004, *Tool for the Demonstration and Assessment of Additionality* (hereafter referred to as the Tool) is applied to demonstrate the additionality of the Project. On P8~P9 of the Tool, it is clarified that "projects are considered similar if they are in the same country/region and/or rely on a

60 Http://www.jxcad.com.cn/simple/index.php?t556314.html.

broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc.".

1) The spatial boundary for identification of similar project activities is determined following the Tool in accordance with the boundary of electricity system determined by China's DNA. As described in paragraphs 12 of the report of the eighteenth meeting of the Meth Panel (http://cdm.unfccc.int/Panels/meth/Meth18_rep_ext.pdf), "In large countries with layered dispatch systems, the regional grid definition should be used. A state/provincial grid definition may in many cases be too narrow given significant electricity trade among states/provinces that might be affected, directly or indirectly, by a CDM project activity. In the presence of significant inter-state/provincial transmission capacity, a regional grid definition represents an imperfect but reasonable default." China is a big country with layered dispatch systems. Therefore, Central China Grid is determined as defined by China's DNA as the boundary of the electricity system of the Project. Central China Area is covered by Central China Grid with 1,299,122 km^2 of land and 382 million of population, therefore it is determined as the spatial boundary in accordance with the boundary of the electricity system.

Then, criteria are established to identify "a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc".

2) The nature of company's ownership for common practice analysis is limited to share holding company. The project owner, Chuanwei Group, is a share holding company. Share holding companies and state-owned companies in China are facing different financing environment and applying different management manners. Taking decision-making for example, the decision makers of state-owned companies undertake less risk in company operation and have to be more obedient to the governmental guidance. Hence new technologies are usually applied in state-owned companies, because any failure wouldn't bring as much pressure to those decision makers. The decision makers of share holding companies, however, have to shoulder much more risk in company operation, so they would not like to employ technologies with barriers and risks. From the above, it is possible for state-owned companies to do those projects under good social and environmental benefits other than poor economic performance and technological barriers. While for share holding companies, the financial indicators are focused on. Therefore the nature of company's ownership for common practice analysis is limited to share holding companies.

3) The production scale for common practice analysis is limited to 1~5 million tons of steel per year. The Project is faced by financing barriers (investment relevant) and technological barriers. Overcoming of these barriers is related to the scale and the policy environment of the project owner to a certain extent, therefore the scale of project owners is employed as one of the criteria to identify "a comparable environment". The project owner is an iron and steel company that produces 3 million tonnes/year of steel and China has established different investment environment regarding iron/steel plants with the production capacity of less than 1 million tonnes/year and more than 5 million tonnes/year of steel as

·According to *Qualification Criteria of Iron Ore Importer in 2007*[61] issued by China Iron & Steel Association and China Chamber of Commerce of Metals Minerals & Chemicals Importers & Exporters, only a steel company with a production capacity of more than 1 million tonnes is licensed to import iron ore.

61 Http://www.csteelnews.com/news/gangtienews/15435.html.

·According to *Policies on the Development of the Iron and Steel Industry*[62], only a steel company with a production capacity of more than 5 million tonnes is licensed to implement a trans-regional investment. Therefore, the production capacity between 1 million tonnes/year to 5 million tonnes/year of steel is employed as the criteria.

As analysed above, all of these criteria are established in accordance with the requirement of the Tool. Project activities similar to the Project are identified in accordance with these criteria as below.

- Regarding on criteria 1), according to the list of top 1000 industrial enterprises in China[63], 9 iron & steel enterprises are share holding companies located in Central China except the project owner.
- Regarding on criteria 2), considering the production scale, 4 iron & steel enterprises out of the 9 iron & steel enterprises are similar to Chuanwei Group, including Pingxiang Iron & Steel Co. Ltd., Henan Jiyuan Iron & Steel Co. Ltd., Sichuan Dazhou Iron & Steel Co. Ltd. and Henan Anyang Yongxing Iron & Steel Co. Ltd..

- Regarding on criteria 3), based on introductions of all these similar iron & steel companies[64,65,66,67], only Henan Anyang Yongxing Iron & Steel Co. Ltd. has installed 3 × 3 MW BFG power plant[68].

As required by CDM EB, the boundary of common practice analysis is expanded to all project activities that employing the technology of combusting pure BFG in China till 2008iron/steel plants in China. Identification process of similar project activities within this expanded boundary is provided below.

The Project started construction in June 2004. There were more than 870 iron/steel plants in China in 2004[69] and only two among these plants employed the technology. Currently, there are more than 1000 iron/steel plants in China[70] and only 11 among these plants employs the technology of combusting pure BFG according to publicly available data. Details of these projects, including the Project, are summarized in Table 2.

Table 2. Projects employing the technology of combusting pure BFG in China till 2008
(sorted by the starting date)

No.	Iron/steel plants	Province	Starting date	CDM
1	*The Project: Chuanwei Group 24MW Waste Gas based Captive Power Plant*	*Sichuan*	*June 2004*	*Correction*
2	Shougang Goup	Beijing	1997	-
3	Tangshan Iron and Steel Co., Ltd	Hebei	2000	-
4	Lengshuijiang Bohong	Hunan	25/08/2006	LOA
5	Kungang 25MW Waste Gas Power Generation	Yunnan	20/02/2004	Validation

62 Http://www.aa.gov.cn/dongtai/ShowArticle.asp?ArticleID=510&Page=1.
63 Http://post.baidu.com/f?kz=36038711.
64 Http://baike.baidu.com/view/135028.htm.
65 Http://www.hnjg.com/gyjg.aspx.
66 Http://www.dasteel.com.cn/main.asp.
67 Http://www.ayyxgt.com/zjyx/qykg.asp.
68 http://ay.ezxw.com/Qyml/info.asp?id=1058.
69 China Galaxy Securities Co., Ltd., *Iron and Steel Industry: to Improve the Giant Enterprises' Value by Resource Integration*, 5th Jun., 2007, http://www.firstmoney.com.cn/Article/UploadFiles/200706/20070620154931665.pdf.
70 Http://gtxh.com/engine/search_gangchang.aspx.

	Project			
6	BFG-fired Power Generation Project in Baosteel Co., Ltd., Shanghai, P. R. China	Shanghai	29/04/2006	Validation
7	Wugang Waste Gas Recovery and Power Generation Project	Hubei	18/07/2006	Validation
8	Tangshan Xinfeng Thermal & Power Co., Ltd. Waste Gas Power Generation Project	Hebei	01/07/2007	Validation
9	Shuangyou Iron&Steel Plant BF-gas Power Generation Project	Yunnan	01/10/2007	Validation
10	Angang Waste Gas Recovery and Generation Project	Inner Mongolia	01/01/2008	Validation
11	Tonghua Iron & Steel Waste Gas Utilization for Power Generation Project	Jilin	01/07/2008	Validation

Most of the projects listed in Table 2 are project activities which have been validated as CDM projects on the UNFCCC CDM website. Following the clarification made in the EB38 meeting report (paragraph 60), these projects are not identified as similar activities to the Project. Only Project No.2 and No.3 listed in Table 2 will be further analyzed in Sub-step 4b.

Please note that BFG CCPP and BFG cogeneration are not listed in Table 2. As required by CDM EB, Essential distinctions between the BFG, BFG CCPP and BFG cogeneration technologies are clarified in below.

There are two reasons for this exclusion: the first is the technology distinction among BFG boiler steam driven power generation plant, BFG CCPP and BFG cogeneration; the second is that BFG CCPP projects implemented in China also face barriers and apply for CDM support.

BFG power generation projects mainly comprise BFG boiler steam driven power generation plant and combined cycle power plant (CCPP), both of these power plants can provide heat simultaneously. According to *Regulations on Cogeneration Development* (Document No.Jijichu[2000]1268), heat-electricity ratio of cogeneration unit with a capacity less than 50 MW must be higher than 100%. Since the Project generates only electricity, it has essential distinctions with BFG cogeneration project. The essential difference between BFG boiler steam driven power generation plant and BFG CCPP is that the former one utilizes the heat of BFG combusted in the boiler to generate steam to drive the steam turbine, while the BFG CCPP utilizes the BFG to combust in the gas turbine, then recover the waste heat of BFG combustion to generate steam to drive the steam turbine.

Prior to the implementation of the Project, there was only one BFG CCPP project named “Shanghai Baosteel-149.6 MW CCPP Project”. As analyzed in the PDD of the registered CDM project-“BOG and COG utilization for Combined Cycle Power CDM Project in Jinan Iron & Steel Works, China”(Project no. 0812),
“Shanghai Baosteel-149.6 MW CCPP Project which was constructed in the mid 1990s using purely imported equipment at a cost equivalent to USD 1,200,000/MW. This plant uses equipment supplied by ABB and Kawasaki. It is generally held in the industry that this project is not economically viable but was constructed as part of the showpiece Baosteel project with central government funding. It is notable that although the project operates reasonably well and was completed nearly 10 years ago there have been no similar projects elsewhere since then, highlighting the commercial challenges for doing such a project”.

Being faced by significant investment barriers and technological barriers, all the BFG CCPP projects implemented in China after the Shanghai Baosteel-149.6 MW CCPP Project, no matter whether mixed BFG with COG or not, apply for CDM support. About 12 waste gas CCPP projects implemented in China have started validation on http://cdm.unfccc.int and 4 of these projects have been registered as CDM projects (Project No.0812, No.1228, No.1262 and No.1416). To make Table 2 clear, the BFG CCPP projects are not included in Table 2. For detailed descriptions on investment barriers and technological barriers faced by waste gas CCPP projects implemented in China, please refer to the PDDs of the above registered waste gas CCPP projects.

In brief, with different criteria, there are only three project activities are identified as similar project activities to the Project. These project activities include:
a) The 3×3 MW BFG Power Generation Project of Henan Anyang Yongxing Iron & Steel Co. Ltd;
b) The project employing the technology of combusting pure BFG in Shougang Group; and
c) The project employing the technology of combusting pure BFG in Tangshan Iron and Steel Co., Ltd..

Therefore, discussion of Sub-step 4b will focuses on these three project activities.

Sub-step 4b. Discuss any similar options that are occurring:

As summarized above, with different criteria, there are only three project activities are identified as similar project activities to the Project. Of these project activities,

Regarding project a):
The 3×3 MW BFG Power Generation Project of Henan Anyang Yongxing Iron & Steel Co. Ltd. employs different technology compared to the Project. According to *Code for Design of Small-size Power Plant (GB50049-94)*, technical requirements of a power plant with a unit capacity equal to or higher than 6 MW are higher than that of a power plant with a unit capacity of 3 MW in steam pressure, water supply, cleaning and safety. For example, sub-medium pressure is applicable for a 3 MW steam turbine while only medium or sub-high pressure can be applicable for a steam turbine more than 6 MW. Therefore it is not comparable to the Project. According to the confirmation letter from China Central Iron & Steel Research Institute, the Project is not a common practice due to its waste gas based power generation technology by combusting solely blast furnace gas in boilers[71].

Regarding project b) and project c):
Even if the spatial boundary is expanded to the whole China and the iron/steel plant scale is expanded to iron/steel plants of all the scale, as described in Table 2 above, only two among these iron/steel plants employs the technology without consideration of CDM. Of these two iron/steel plants,

·Shougang Group is the developer of the technology of combusting pure BFG. It is a state owned company and ranked 27th among the largest steel companies in the world in 2007[72] with a production capacity of more than 5 times that of the project owner.

·Tangshan Iron and Steel Co., Ltd. is a state owned company and ranked 8th among the largest steel companies in the world in 2007[73] with a production capacity of about 10 times that of the project owner.

71 According to confirmation issued by the Central Iron & Steel Research Institute and validated by DOE, in China, no more than 10% of the iron & steel plants similar scale to the Chuanwei Group have applied that technology.
72 Http://news.hexun.com/2008-03-28/104846424.html.
73 Http://news.hexun.com/2008-03-28/104846424.html.

Since the project owner, ranked 101st among the largest steel companies in the world in 2007[74], is a share-holding enterprise ranked far behind Shougang Group and Tangshan Iron and Steel Co., Ltd., it is much different from the project owner (Chuanwei Group) with respect to regulatory framework, investment climate, access to technology, access to financing, etc.

These facts demonstrate that the Project is not a common practice, thus additional.

Summary

The Project faces prohibitive investment barriers and technological barriers. Before construction of the Project, the project owner was seriously aware of these prohibitive barriers the Project is faced with. So, the project owner was actively searching for CDM cooperation to overcome these barriers and reduce project risks. The project owner started considering of CDM in early 2004, decided to apply CDM assistance for the Project on 08/04/2004 and entrusted Chengdu Saiensi Energy Investment & Management Co. Ltd (hereafter referred to as Saiensi) to establish CDM cooperation pipeline in May of 2004. With the efforts of Saiensi, the Project became one of China's projects shown at the 2005 Carbon Expo in Cologne, German, and one of the candidate CDM projects collected by Ministry of Science and Technology in early 2005.

The CDM development of the Project plays an important role in alleviating investment barriers and technological barriers identified in following ways:

First, paralleled with the CDM progress, Saiensi had successfully introduced the equity capital for the Project from Neijiang Xingyuan Power Generation Group by convincing them that the CDM revenue can guarantee a satisfied financial return from the Project.[75] With confidence that the CERs sales revenues of the Project can ensure a satisfied financial return, Neijang Xingyuan Power Generation Group undertook about 40% of the total investment of the Project.

Second, the CDM development of the Project attracts extensive social attentions. Many news media, including the Channel 2 of China Central Television (CCTV-2), have reported the CDM development of the Project and given highly positive comments[76], which brought very good social reputation to Chuanwei Group and made the decision-makers of Chuanwei Group to recognize the Project[77]. Then, the capital shortage of the Project was solved by the management of Chuanwei Group and the Project resumed constructing after almost half year of stand-down.

Third, the Project established cooperation between Neijang Xingyuan Power Generation Group and Chengdu Saiensi Energy Investment & Management Co., Ltd. through CDM. Neijang Xingyuan Power Generation Group specializes in power plant operation and management. Saiensi is one of executive units of NDRC/WB/GEF Energy Conservation Project, one of Board Members of Energy Management

74 Http://news.hexun.com/2008-03-28/104846424.html.
75 Letters between Saiensi and Neijiang Xingyuan Power Generation Group and the letter from Neijiang Xingyuan Power Generation Group to the project owner from May 2004 to January 2005 have been provided to the DOE, which demonstrate the investment barriers confronted the Project and how they could be overcome by employing the CDM revenue..
76 http://news1.jrj.com.cn/news/2006-09-20/000001660705.html,
http://news.cctv.com/science/20070114/101560.shtml
77 Referred to the top management meeting minute about the Project.

Company Association (EMCA) in China and one of Board Members of Chinese Renewable Energy Industries Association. Saiensi is a professional energy service company with many experiences in installation, maintenance and operation of energy saving projects. It would provide long-term technical service for the installation, maintenance and operation of the Project under the condition that the CERs sales revenues are granted as the payback guaranty of its service[78]. With technical services provided by Saiensi, the technological barriers faced by the Project can be alleviated. About 7 times of breakdown have taken place since the Project started operation in July 2006. According to the electricity generation record of the Project, power generation of the Project in 2006 and 2007 are both 12% less than that in the FSR. The fact clearly demonstrates that CERs sales revenues will be critical for the project owner to cover the loss due to lack of well trained operators and to organize high level training courses for their employees to become well trained operators.

To summarize, the Project satisfies additionality requirements of CDM because it faces prohibitive barriers which can be alleviated by CDM.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The consolidated methodology ACM0004 is applied in the context of the Project in the following five steps:

·First, calculate the baseline GHG emissions;

·Second, calculate the project GHG emissions;

·Third, calculate the project leakage;

·Fourth, calculate the emission reductions.

I. Calculate the baseline GHG emissions

Baseline scenario of the Project is grid electricity supply, as required by the consolidated baseline methodology ACM0004, the emission factor of the displaced electricity of the Central China Grid should be calculated as per the consolidated baseline methodology ACM0002.

Baseline emission factors of operating margin ($EF_{OM,y}$) and build margin ($EF_{BM,y}$) were determined ex ante. The baseline emission factor (EF_y) is calculated as a combined margin (CM) of $EF_{OM,y}$ and $EF_{BM,y}$, according to the following three steps:

STEP 1. Calculate the Operating Margin Emission Factor(s) ($EF_{OM,y}$) based on one of the four following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

78 Referred to the agreement between Saiensi and the Project owner.

Each method is analyzed as below.

Method (a) Simple OM

The simple OM method only can be used when low-cost/must run resources constitute less than 50% of total amount of grid generating output 1) in the recent five years, or 2) by taking into account long-term normal for hydroelectricity generation. Among the total electricity generations of the Central China Grid which the Project is connected into, the amount of low-cost/must run resources accounts for about 36.76% in 2001, 35.95% in 2002, 32.86% in 2003, 32.36% in 2004 and 38.18% in 2005, all less than 50% (see Annex 3 for details). Thus, the method (a) Simple OM can be used to calculate the baseline emission factor of operating margin ($EF_{OM,y}$) for the Project.

Method (b) Simple adjusted OM

The application of simple adjusted OM method requires annual load duration curve of the grid. The power sector in China is in a transitional period of "separating the plant operation from the grid operation", resulting in the detailed data of dispatch and fuel consumption are often taken as confidential business information by the grid company and the power plants. Therefore those data are not publicly available. In most cases, it is difficult for the CDM projects in China to adopt Method (b) for the calculation of the baseline emission factor of operating margin ($EF_{OM,y}$). Similarly, the Project can not adopt Method (b) for the calculation of the baseline emission factor of operating margin ($EF_{OM,y}$) due to unavailability of the dispatch data of the Central China Grid.

Method (c) Dispatch data analysis OM

Dispatch data analysis OM method should be the first choice if the dispatch data are available, because the method can truly reflect the substitutable relationship between the amount of electricity output from power plants of the baseline grid and that from the Project activity and the emission reductions generated. However, Method (c) cannot be adopted for the Project because of unavailability of the dispatch data of the Central China Grid, similar reason as method (b).

Method (d) Average OM

Method (d) can only be used when 1) low-cost/must run resources constitute more than 50% of total amount of grid electricity output and 2) detailed data required by applying method (b) and method (c) is unavailable. Among the total electricity generations of the Central China Grid which the Project is connected into, the amount of low-cost/must run resources accounts for about 36.76% in 2001, 35.95% in 2002, 32.86% in 2003, 32.36% in 2004 and 38.18% in 2005, all less than 50% (see Annex 3 for details). Therefore method (d) cannot be applied to the Project.

In conclusion, Method (a) Simple OM is the only reasonable and feasible method among the four methods for the calculation of the operating margin emission factor(s) ($EF_{OM,y}$) of the Project.

In accordance with the consolidated baseline methodology ACM0002, the Simple OM emission factor ($EF_{OM,simple,y}$) is calculated ex ante. The formula of $EF_{OM,simple,y}$ calculation is

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \quad (1)$$

where:

$F_{i,j,y}$ is the total amount of fuel i (in a mass or volume unit) consumed by province j in year(s) y,

$COEF_{i,j,y}$ is the total amount the CO_2 emission coefficient of fuel i (tCO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels (coal, oil and gas) used by province j and the oxidation rate of the fuel in year(s) y, and

$GEN_{j,y}$ is the electricity output (MWh) supplied to the grid by province j.

The CO_2 emission coefficient $COEF_i$ is then obtained from equation (2) as

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \quad (2)$$

where:

NCV_i is the net calorific value (energy content) per mass or volume unit of fuel i,

$OXID_i$ is the oxidation factor of the fuel i, and

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel i.

Since there exists no net electricity imports ($COEF_{i,j,imports}$) in the Central China Grid, the emission factor(s) of other grid is not considered in the Project.

The data on electricity generation and auxiliary electricity consumption are obtained from *China Electric Power Yearbook* from 2004 to 2006. The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from *China Energy Statistical Yearbook* from 2004 to 2006. The emission factors and oxidation factors of the fuels adopted are obtained from Table 1.3 and Table 1.4 on P1.21-1.24 of Chapter 1, Volume 2 of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

With reference to the calculation table provided in the *Notification on Determining Baseline Emission Factor of China's Grid*, the Simple OM emission factor ($EF_{OM,y}$) of the Central China Grid is 1.2909 tCO_2e/MWh (see Annex 3 for details).

STEP 2. Calculate the Build Margin Emission Factor ($EF_{BM,y}$) according to the consolidated baseline methodology ACM0002 using equation (3):

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}} \quad (3)$$

where:

$F_{i,m,y}$ is the amount of fuel i (tCe) consumed by relevant power source m in year(s) y,

$COEF_{i,m,y}$ is the CO_2 emission coefficient of fuel i (tCO_2/tCe), taking into account the carbon content of the fuels (coal, oil and gas) used by relevant power source m and the percent oxidation of the fuel in year(s) y, and

$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by source m.

Option 1, calculate the Build Margin emission factor ($EF_{BM,y}$) ex-ante based on the most recent information available on plants already built for sample group m at the time of PDD submission was selected for the Project.

According to the consolidated baseline methodology ACM0002, the sample group m consists of either (1) the five power plants that have been built most recently, or (2) the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. It is suggested that the sample group that comprises the larger annual generation should be used.

Consider of data availability, CDM EB accepts the following deviation in application of methodology[79]:
1) Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for grid electricity.
2) Use of weights estimated using installed capacity in place of annual electricity generation.

And it is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

Therefore for the Project: First, calculate the share of different power generation technology in recent capacity additions. Second, calculate the weight for capacity additions of each power generation technology. And finally calculate the emission factor use the efficiency level of the best technology commercially available in China.

Since data of installed capacities can not be separated to coal based, oil based and gas based at present, BM is calculated with following steps and formula:

Step a. Calculate the power generation emissions for solid, liquid and gas fuel and each share of total emissions based on the *Energy Balance Table* of the most recent year.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \tag{4}$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \tag{5}$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \tag{6}$$

where:

$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by power plant j in year(s) y,

79 Http://cdm.unfccc.int/Projects/Deviations.

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel i (tCO_2/mass or volume unit), taking into account the carbon content of the fuels used by power plant j and the percent oxidation of the fuel in year(s) y, and

COAL, OIL and GAS are footnote group for solid fuels, liquid fuels and gas fuels.

Step b. Calculate emission factor for thermal power of the grid based on the result of Step a and the efficiency level of the best technology commercially available in China.

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (7)$$

Where $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are emission factor proxies of efficiency level of the best coal-fired, oil-based and gas-based power generation technology commercially available in China.

Step c. Calculate BM of the grid based on the result of Step b and the share of thermal power of recent 20% capacity additions.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (8)$$

Where CAP_{Total} is total capacity additions while $CAP_{Thermal}$ is capacity additions of thermal power.

The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2004 to 2006. The emission factors and oxidation factors of the fuels adopted are obtained from Table 1.3 and Table 1.4 on P1.21-1.24 of Chapter 1, Volume 2 of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

With reference to the *Notification on Determining Baseline Emission Factor of China's Grid*, the weighted average fuel consumption for power generation of 14 sets of 600 MW coal-fired power generators built in 2005 (343.33 gCe/kWh) and the 200 MW oil/gas based combined cycle power generators (258 gCe/kWh) are taken as the efficiency level of the best technology commercially available in China.

With reference to the *Notification on Determining Baseline Emission Factor of China's Grid,* the Build Margin emission factor ($EF_{BM,y}$) of the Central China Grid is 0.6592 tCO_2e/MWh (see Annex 3 for details).

STEP3. Calculate the baseline emission factor (EF_y)

Based on the consolidated baseline methodology ACM0002, the baseline emission factor (EF_y) is calculated as the weighted average of the operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$), as

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \quad (9)$$

According to the consolidated baseline methodology ACM0002, both the weight w_{OM} and the weight w_{BM} take 0.5 as default. Therefore the combined baseline emission factor EF_y=0.5×1.2909+0.5×0.6592=0.97505 (tCO_2e/MWh).

Baseline emissions

Baseline emissions are calculated with combined baseline emission factor and the electricity delivered to the grid by the project as follows:

$$BE_y = EG_y \times EF_y \tag{10}$$

II. Calculate the project GHG emissions

Small amount of auxiliary fuel gas with higher net caloric value is consumed for start-up of the Project and as the fuel for the constant flare point which is distributed in the boiler to prevent uneven combustion of BFG. Project emissions are generated from the combustion of the auxiliary fuel gas which is calculated according to the consolidated baseline methodology ACM0004 with equation (11):

$$PE_y = \sum_i Q_i \times NCV_i \times EF_i \times \frac{44}{12} \times OXID_i \tag{11}$$

where:

PE_y is the project emissions in year y (tCO_2e),

Q_i is the mass or volume unit of fuel i consumed (t or m^3),

NCV_i is the net calorific value per mass or volume unit of fuel i (TJ/t or m^3),

EF_i is the carbon emissions factor per unit of energy of the fuel i (tC/TJ),

$OXID_i$ is the oxidation factor of the fuel i.

Since the auxiliary fuel gas consumption is tightly correlated to the operation of the Project and the type of the auxiliary fuel gas is undetermined at present (maybe natural gas, surplus coke oven gas (COG) or LD gas which should be flared in the absence of the Project), the project emissions will be calculated ex post based on monitoring data. If surplus COG or LD gas which should be flared in the absence of the Project is used as auxiliary fuel gas, the emissions generated from the combustion of COG or LD gas should not be considered as per the consolidated baseline methodology ACM0004. Project emission is estimated conservatively in the PDD based on the assumption that natural gas is used as auxiliary fuel gas to provide 1% of the total heat value of BFG.

III. Calculate the project leakage

According to the consolidated baseline methodology ACM0004, no leakage is considered, $L_y = 0$ tCO_2e.

IV. Calculate the emission reductions

As per the consolidated baseline methodology ACM0004, no leakage is considered in the Project. The emission reduction (ER_y) by the project activity during a given year y is the difference between the baseline emissions though substitution of electricity generation with fossil fuels (BE_y) and project emissions (PE_y), as follows:

$$ER_y = BE_y - PE_y \tag{12}$$

where:

ER_y is the emissions reductions of the project activity during the year y (tCO_2e),
BE_y is the baseline emissions due to displacement of electricity during the year y (tCO_2e),
PE_y is the project emissions during the year y (tCO_2e).

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	$F_{i,j,y}$
Data unit:	in a mass or volume unit
Description:	the total amount of fuel i consumed by province j in year(s) y
Source of data used:	*China Energy Statistical Yearbook*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The *China Energy Statistical Yearbook* is reliable data source.
Any comment:	-

Data / Parameter:	$GEN_{j,y}$
Data unit:	MWh
Description:	electricity output supplied to the grid by province j.
Source of data used:	*China Electric Power Yearbook*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The *China Electric Power Yearbook* is reliable data source.
Any comment:	-

Data / Parameter:	NCV_i
Data unit:	energy content per mass or volume unit
Description:	net calorific value of fuel i
Source of data used:	*China Energy Statistical Yearbook*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The *China Energy Statistical Yearbook* is reliable data source.
Any comment:	-

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	oxidation factor of the fuel i
Source of data used:	*2006 IPCC Guidelines*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The *2006 IPCC Guidelines* is reliable data source.
Any comment:	-

Data / Parameter:	$EF_{CO2,i}$
Data unit:	$kgCO_2$ per mass or volume unit
Description:	CO_2 emission factor per unit of energy of the fuel i
Source of data used:	*2006 IPCC Guidelines*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The *2006 IPCC Guidelines* is reliable data source.
Any comment:	-

Data / Parameter:	$F_{i,m,y}$
Data unit:	in a mass or volume unit
Description:	the total amount of fuel i consumed by province m in year(s) y
Source of data used:	*China Energy Statistical Yearbook*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The *China Energy Statistical Yearbook* is reliable data source.
Any comment:	-

Data / Parameter:	$GEN_{m,y}$
Data unit:	MWh
Description:	electricity output supplied to the grid by province m.
Source of data used:	*China Electric Power Yearbook*
Value applied:	See Annex 3 for details.
Justification of the choice of data or	The *China Electric Power Yearbook* is reliable data source.

description of measurement methods and procedures actually applied :	
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

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I. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

According to the *Feasibility Study Report* of the Project, the annual power generation is estimated to be 190 GWh. The baseline emission factor for the Project is 0.97505 tCO_2e/MWh and the annual baseline emission of the Project is 185,260 tCO_2e.

II. Estimated project activity emissions:

Since the auxiliary fuel gas consumption of the Project is tightly correlated to the operation of the Project and the type of the auxiliary fuel gas is undetermined at present (maybe natural gas, surplus coke oven gas (COG) or LD gas which should be flared in the absence of the Project), the project emissions will be calculated ex post based on monitoring data.

Project emission is estimated conservatively in the PDD based on the assumption that natural gas is used as auxiliary fuel gas to provide 1% of the total caloric value of BFG. The Project is designed to combust 11.95×10^8 m^3 of BFG per year. At present, the net caloric values of the combustible components of blast furnace gas of the Chuanwei Group are ranging from 2510~3340 kJ/m^3 and 3340 kJ/m^3 is conservatively used for estimation. The carbon emissions factor and oxidation factor of natural gas are obtained from the 2006 IPCC Guidelines. Therefore the annual Project emissions are estimated as

$$PE_y = 1\% \times 11.95 \times 10^8 m^3 \times 3340 kJ / m^3 \times 56100 \mathrm{kgCO2/TJ} \times 100\% / 1000 = 2239 \ tCO_2e.$$

III. Estimated project leakage:

As per the consolidated baseline methodology ACM0004, the leakage of the Project is not considered, i.e. L_y =0 tCO_2e.

IV. Estimated emission reductions

As per formula provided in Section B.6.1, the annual emission reductions of the Project are 183,021 tCO_2e.

B.6.4 Summary of the ex-ante estimation of emission reductions:

Renewable crediting period is adopted for the Project. It is expected that the Project activities will generate emission reductions for about 183,021 tCO_2e per year over the first 7-year crediting period from 01/09/2008 to 31/08/2015.

Year	Estimation of	Estimation of	Estimation of	Estimation of

	project activity emissions (tonnes of CO_2e)	baseline emissions (tonnes of CO_2e)	leakage (tonnes of CO_2e)	overall emission reductions (tonnes of CO_2e)
2008[80]	2,239	185,260	0	183,021
2009	2,239	185,260	0	183,021
2010	2,239	185,260	0	183,021
2011	2,239	185,260	0	183,021
2012	2,239	185,260	0	183,021
2013	2,239	185,260	0	183,021
2014	2,239	185,260	0	183,021
Total (tCO_2e)	**15,673**	**1,296,820**	**0**	**1,281,147**

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity supply by the Project in year y
Source of data to be used:	Data in the PDD is obtained from the *Feasibility Study Report*, and the real data will be obtained from continuously measurement.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	190,000
Description of measurement methods and procedures to be applied:	Continuously monitored through No.503 and No.583 metering equipments installed at the No.1 substation of Chuanwei Group where electricity will be delivered into the Chuanwei Group and automatically recorded per hour.
QA/QC procedures to be applied:	Electricity generation, auxiliary electricity consumption and electricity supply record are used to ensure the consistency.
Any comment:	-

Data / Parameter:	EG_{gen}
Data unit:	MWh
Description:	Electricity generation by the Project in year y
Source of data to be used:	Data in the PDD is obtained from the *Feasibility Study Report*, and the real data will be obtained from continuously measurement.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	207,360

80 Calculation period for a natural year is from September 1st of that year to August 31st of the next year.

Description of measurement methods and procedures to be applied:	Continuously measured by ammeters No.501 and No.581 installed at the outlet of the generator by digital computer system, and automatically recorded per hour.
QA/QC procedures to be applied:	Electricity generation, auxiliary electricity consumption and electricity supply record are used to ensure the consistency.
Any comment:	-

Data / Parameter:	EG_{AUX}
Data unit:	MWh
Description:	Auxiliary electricity consumption by the Project in year y
Source of data to be used:	Data in the PDD is obtained from the *Feasibility Study Report*, and the real data will be obtained from continuously measurement.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	17,360
Description of measurement methods and procedures to be applied:	Continuously measured by ammeters No.502 and No.582 installed at the transformers for auxiliary electricity in the project plant by digital computer system, and automatically recorded per hour.
QA/QC procedures to be applied:	Electricity generation, auxiliary electricity consumption and electricity supply record are used to ensure the consistency.
Any comment:	-

Data / Parameter:	Q_i
Data unit:	m^3
Description:	Volume of the auxiliary fuel i
Source of data to be used:	Assume that natural gas is used as auxiliary fuel gas to provide 1% of the total heat value of BFG consumed by the Project in the PDD. And the real data will be obtained from continuously measurement.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1,025,224
Description of measurement methods and procedures to be applied:	Continuously measured by gas flow meter at the intake pipe and monthly recording by the project owner.
QA/QC procedures to be applied:	Double checked against fuel purchase record

Any comment:	Only natural gas is considered as auxiliary fuel gas in the PDD. The Volume of natural gas was obtained using 1% of the total heat value of BFG consumed by the Project divided by net caloric value of natural gas from *China Energy Statistical Yearbook* 2005 Edition.

Data / Parameter:	NCV_i
Data unit:	TJ/m^3
Description:	Net calorific value per volume unit of fuel i
Source of data to be used:	Data in the PDD is obtained from *China Energy Statistical Yearbook* 2005 Edition. Real data is obtained from the latest edition of *China Energy Statistical Yearbook*.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3.8931×10^{-5} for natural gas
Description of measurement methods and procedures to be applied:	Data obtained from the latest edition of *China Energy Statistical Yearbook*.
QA/QC procedures to be applied:	Copy and document the *Conversion factors from physical units to coal equivalent* in the latest edition of *China Energy Statistical Yearbook for verification*.
Any comment:	Only natural gas is considered as auxiliary fuel gas in the PDD. If other type of fuel is used in the Project, obtain the net calorific value for the fuel from the latest edition of *China Energy Statistical Yearbook*.

Data / Parameter:	EF_i
Data unit:	tC/TJ
Description:	Carbon emission factor of the fuel i
Source of data to be used:	Data in the PDD is obtained from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	15.3 for natural gas
Description of measurement methods and procedures to be applied:	Data obtained from the latest version of IPCC Guidelines.
QA/QC procedures to be applied:	Copy and document the page in IPCC Guidelines *for verification*.
Any comment:	Only natural gas is considered as auxiliary fuel gas in the PDD. If other type of fuel is used in the Project, obtain the net calorific value for the fuel from the latest version of IPCC Guidelines. EF_i was transformed from 56100 $kgCO_2e/TJ$ to 15.3 tC/TJ to keep the consistency with equation (11) provided

	by methodology ACM0004.

Data / Parameter:	$OXID_i$
Data unit:	-
Description:	Oxidation factor of the fuel i
Source of data to be used:	Data in the PDD is obtained from Page 2.6 of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100% for natural gas
Description of measurement methods and procedures to be applied:	Data is obtained from the latest version of IPCC Guidelines.
QA/QC procedures to be applied:	Copy and document the page in IPCC Guidelines *for verification*.
Any comment:	Only natural gas is considered as auxiliary fuel gas in the PDD. If other type of fuel is used in the Project, obtain the oxidation factor for the fuel from the latest version of IPCC Guidelines.

B.7.2 Description of the monitoring plan:

Baseline emission factor of the Project is determined ex ante. Therefore the net electricity supply and the consumption of auxiliary fuel gas of the Project are defined as the key data to be monitored. The monitoring plan is drafted to focus on monitoring the net electricity supply and the consumption of auxiliary fuel gas of the Project.

1. Calibration of Meters & Metering

The measurement precision of the ammeters employed by the Project is 0.5% for electricity generation and 1.0% for electricity supply and auxiliary power consumption. Calibration of meters & metering should be implemented according to the supply agreement of high voltage electricity of the Project at least once a year. And all the records should be documented and maintained by the project owner for DOE's verification.

2. Improvement of Quality Assurance and Quality Control

The quality assurance and quality control procedures for data and parameters to be monitored will be carried out as per Section B.7.1. The quality assurance and quality control procedures also include maintaining and archiving data. It will be improved as part of this CDM project activity according to CDM EB rules and real practice in terms of the need for verification of the emission reductions.

3. Error detection and correction procedure

Prior to be archived, all the data should be cross checked by the staff in charge of data handling and reporting and the staff in charge of quality control. If errors have been detected, error detection and disposal reports should be submitted to the person in charge of CDM, after receiving whose approval, the errors should be corrected. If these errors occur as a result of inadequacy of QA and QC procedure, management staff in charge of quality control should submit to the person in charge of CDM suggestions on improving QA and QC procedure, and after the approval is obtained should conduct the implementation.

4. Emergency treatment

If ammeters fail during operation period, actual net electricity supply by the Project can not be determined directly from ammeters' readings. In such case, the actual net electricity supply by the Project should be determined with reference to the calibration result and etc. according to the *Rules of Supplying Electricity Business*.

5. Data Management System

Specific staff will be appointed by the project owner to take the overall responsibility for monitoring greenhouse gas emission reductions and keeping all the data collected as part of monitoring archived electronically and kept at least for two years after the end of the last crediting period.

Electronic data and documents, including readings from electric meters connected into the computer central control system, will be regularly copied and archived via optical discs and storage tapes, and kept at least for two years after the end of the crediting period.

Written data and documents, including receipts for cross-checking of data, will be copied and archived with an explanation of the department or company where the original copy is kept, and kept for at least two years after the end of the crediting period.

6. Training Plan

Prior to the submission of the Project request for registration, the task of training staff in charge of executing the monitoring plan will be completed, with the training contents including basic concepts and operation modality of CDM, methods of data monitoring and archiving for CDM projects, quality control and quality assurance of monitoring, and preparation and improvement of key documents of monitoring.

7. Security monitoring

To guarantee the safety of operation, security monitoring and protection facilities are equipped for the boiler system, turbine system and electric system of the Project. Since the BFG employed by the Project will be directly flared in the baseline scenario, even if accidents occur, no unintended emission will arise from the leakage of BFG.

8. Verification

It is expected that the verification of emission reductions generated from the Project will be done annually. Besides the data and documents required in Section B.7., other documents will be prepared by the project owner for verification including, but not limited to:

· PDD (registration version), including the electronic spreadsheets and supporting documentation (assumptions, estimations, measurement, etc);

·Report on qualifications of persons responsible for the monitoring and calculation;

·Report on Quality Control and Quality Assurance;

·Report on maintenance and calibration of meters;

·Report on Project Management Record (including data collection and management system).

9. Monitoring flowchart

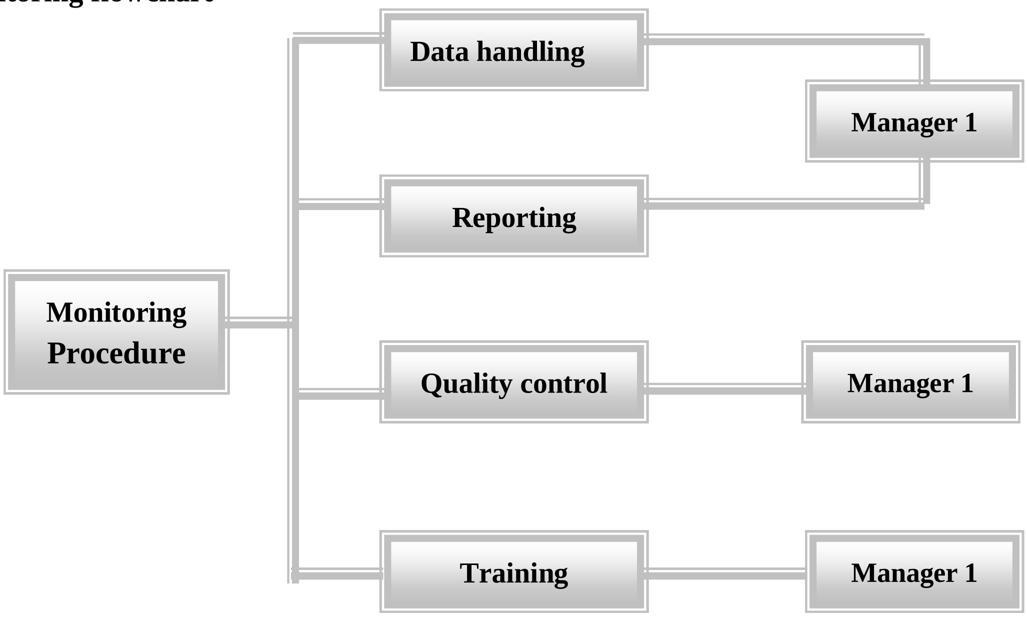

Figure 5. Monitoring flowchart

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

The application of the baseline study and monitoring methodology of the Project was completed on 05/08/2008 by below parties:

Name/Organization	Project participate Yes/No
Dr. Zheng Zhaoning, Ms. Pan Tao	No
Millennium Capital Services 1202 Jinbao Office Building, 89 Jinbao Street, Dongcheng District, Beijing 100005, P.R.China Tel: +86 (10) 8522 1916 Fax: +86 (10) 8522 1906	No

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>

30/06/2004 (Construction starting date)

The price index in China keeps increasing from 1997 and reaches the highest increasing rate in 2004[81]. In June 2004, 32 million RMB equity (less than 20% of the total investment) had been arranged by the project owner and outside investment financing from both investors and local banks had been started. To avoid the idling loss of capital and the risk of increase of material and employee cost, the project owner started construction preparation in June 2004 and tried their best to delay the payment of equipments. Since the project owner started construction of the Project without sufficient financing, they had to delay payment to equipment suppliers. The evidences of delaying payment are provided and validated by DOE. Moreover without sufficient investment, the project owner had to cancel the installation of coal gas tank and prolong the construction process of the Project for almost 1 year.

C.1.2. Expected operational lifetime of the project activity:

>>

25y-0m

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>>

01/09/2008

C.2.1.2. Length of the first crediting period:

>>

7y-0m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

Not applicable.

C.2.2.2. Length:

>>

81 Http://www.people.com.cn/GB/shehui/1063/3064472.html.

Not applicable.

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>
The EIA Report of the Project completed by the Metallurgical Industry Environmental Protection Monitoring Institute of Sichuan Province, and approved by the Sichuan Environmental Protection Agency in Oct., 2005 (Document No. Chuanhuanjianhan [2005]527).

The environmental impacts arising from the proposed project are analyzed separately for the construction phase and the operation phase.

Construction Phase

Air pollution

The Project is constructed within the plant area of Chuanwei Group. During the construction period, small amount of dust may be discharged due to transportation, unloading and dumping of construction materials, and exhaust emissions may be result from fuel oil combustion of transportation vehicles. The dust will be controlled by watering, and the bulk cement will be transported by air-tight vehicles. Air pollutants emitted during the construction period are at low level whose effect on the air quality of the environment is trivial and will be eliminated along with the completion of the construction period.

Waste water

Waste water generated by both construction and living activities will be discharged during the construction period. Waste water resulting from rinsing and leakage generated in the process of mixing concrete is about 5 m^3 per day. With suspended substance as major pollutants, it will be treated for recycle.

Waste water generated by living activities of the employees is mainly related to bathing and toilet usage. Total amount of waste water caused by living activities is about 8 m^3 per day. Waste water related to bathing is directly discharged, while that related to toilet usage is discharged after being treated in septic tank.

Noise

Noises of the construction site is generated from transportation, unloading of materials, operation of pile driver, mixing of concrete, operation of machines, whooping of materials or construction instrument, the degree of which range from 80~110 dB(A). Within 200 meters outside the construction site, there are two sites sensitive to the noises, the Chuanwei Training Centre and the Nongjiale Hotel of Shuangqiao Village, which have a permanent population of 25 and no concentrated residential area.

To avoid the construction noises from disturbing the residents, the construction activities that cause strong noises are required only be carried out in the day time, and operation of pile driver is prohibited at night.

Discarded soil

There are about 2,750 m^3 of discarded soil generated by the Project. The discarded soil will be dumped at the Lianjie Town Landfill. The landfill is designated by the government of Lianjie Town as the landfill for construction discarded soil and industrial solid waste. Due to the fact that the landfill is a naturally-formed trench, and the discarded soil of the Project is identical to the local soil, so the dumped soil will not have polluting effects on the ground water nearby.

<u>Operation Phase</u>

Waste water

Employees of the Project are totally recruited from the current or laid-off workers of Chuanwei Group, which will not increase the quantity of waste water discharged by living activities. The technology of “zero discharge” of waste water is adopted for the whole electricity generation system, and waste water generated by the electricity generation system will be recycled as the makeup water for the operation of smelting system of Chuanwei Group, thus discharging no waste water in the production process.

Solid waste

After the construction of the Project, a sedimentation pool will be built for the purpose of “zero discharge” of solid waste in the electricity generation system, which will generate about 20 tons of sludge. The sludge will be transported by tank car to be dehydrated by the sludge dehydration equipment of converter, and then delivered to Sanli Company where the sludge will be mixed into the steel slag which can be sold to out users.

Noise

Major noise sources of the Project include turbines, generators, wind blower and induced draught fans of boilers, water pumps and steam ventilation. When they are in operation, the noise level is between 80~100 dB(A). Comprehensive measures to control the noises have been designed for the Project, details of the measures and its effects are illustrated in Table 3:

Table 3. Major noise sources and measures to control the noises during operation period

No.	Major noise sources	Quantity (sets)	Measures to control the noises	Noise level without control measures dB(A)	Noise level with control measures dB(A)
1	Turbine	2	Semi-closed structure is adopted for the Project, and the control room for noise insulation is built.	95	84
2	Generator	2			
3	Wind blower of boilers	2	Mufflers are installed at the air inlet.	95	83
4	Induced draught fans of boilers	2	Mufflers are installed at the air outlet, and wind pipes are wrapped in a sound-insulated manner.	90	80
5	Steam ventilation of boilers		Noise abatement devices for steam exhausting are installed.	100	83
6	Electric water-feeding pump	4	Pump-house is used to insulate sound, flexible joints are added to water pumps, and damping equipment is installed at the pump base.	88	82
7	Condensate pump	4			
8	Water circulating pump	4	Pump-house is used to insulate sound.	86	78
9	Cooling tower of circulating water	1	-	76	76

In conclusion, environmental impacts arising from the Project are considered insignificant.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

Impacts are not considered significant.

SECTION E. Stakeholders’ comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>
In Nov 2005, assisted by the Metallurgical Industry Environmental Protection Monitoring Institute of Sichuan Province, Chuanwei Group carried out a survey of the local residents in the area where the proposed project will be sited. The questionnaire mainly focuses on the following questions:

·what attitudes do these stakeholders have towards the construction of the Project？

·what kind of positive and negatives impacts do these stakeholders think the project implementation might have？

·What suggestions do these stakeholders have on eliminating the negative impacts.

Comments received through the survey are summarized as follows. The government of Weiyuan County issued a support letter for the Project. It is available for DNA and DOE.

E.2. Summary of the comments received:

>>
The survey was conducted through distributing and collecting responses to a questionnaire. Totally 60 questionnaires returned out of 60 with 100% response rate. The basic structure of the respondents is illustrated in Table 4.

Table 4. Statistics on the basic conditions of people surveyed

Structure of occupation		
Occupation	**Number**	**%**
Worker	42	70
Cadre	4	6.7
Villager	11	18.3
Teacher	2	3.3
Student	1	1.7
Total	60	100

Structure of educational level		
Educational level	**Number**	**%**
Junior college and above	13	21.7
Technical secondary school	21	35
Senior high school	12	20
Junior high school	12	20
Elementary school	2	3.3
Total	60	100

Structure of age		
Age	**Number**	**%**
20~29	40	66.7
30~39	13	21.7
40~49	4	6.6
50~59	3	5
Over 60	0	0
Total	60	100

As shown by Table 4, people surveyed are broadly representative of the public in terms of age structure, occupations, educational levels, etc., and their attitudes towards the production and pollution emission impacts of the Project can be a comprehensive reflection of the attitudes of the public affected by the Project. Among the 60 responses to the questionnaire:

·53 respondents (accounting for 88.33%) support the Project, 7 respondents (11.67%) shows indifference towards the construction.

·44 respondents (accounting for 73.33%) consider that the construction of the Project have no impact on habitation, 15 respondents (accounting for 25.00%) consider that the construction of the Project have minor impacts on habitation, and 1 respondents (accounting for 1.67%) consider that the construction of the Project have obvious impacts on habitation.

·41 respondents (accounting for 68.33%) consider that the construction of the Project have no impact on nearby village residents, 17 respondents (accounting for 28.33%) consider that the construction of the Project have minor impacts on nearby village residents, and 2 respondents (accounting for 3.33%) consider that the construction of the Project have obvious impacts on nearby village residents.

·41 respondents (accounting for 68.33%) consider that the construction of the Project have no impact on nearby village residents, 17 respondents (accounting for 28.33%) consider that the construction of the Project have minor impacts on nearby village residents, and 2 respondents (accounting for 3.33%) consider that the construction of the Project have obvious impacts on nearby village residents.

·50 respondents (accounting for 83.33%) consider that the construction and operation of the Project can effectively promote local economy development, 10 respondents (accounting for 16.67%) consider that the construction and operation of the Project have minor contribution to local economy development

·39 respondents (accounting for 65.00%) consider that the construction and operation of the Project have no negative impact on local environment, 21 respondents (accounting for 35.00%) consider that the construction and operation of the Project have minor negative impact on local environment.

E.3. Report on how due account was taken of any comments received:

>>

Based on stakeholders' comments, the environment protection measures to reduce air pollutants and noise were adopted by the project owner, detailed measures referred to section D.1.

The residents and local government are all very supportive of the Project therefore there has been no need to modify the Project due to the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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State/Region:	Sichuan Province
Postfix/ZIP:	642469
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FAX:	+86 (0) 832-8833075
E-Mail:	-
URL:	-
Represented by:	Xie Jianguo
Title:	Board Chairman
Salutation:	Mr.
Last Name:	Xie
Middle Name:	-
First Name:	Jianguo
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Title:	-
Salutation:	Mr.
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I Parties for this Project.

Annex 3

BASELINE INFORMATION

Data recommended in the *Notification on Determining Baseline Emission Factor of China's Grid* for the Central China Grid are adopted for the Project while the IPCC default adopted have been updated to data provided in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

The *Notification on Determining Baseline Emission Factor of China's Grid* is issued by China's DNA on August 9th, 2007 on its official website (http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1889). Therefore, the data is transparent and reliable.

The following tables summarise the numerical results from the equations listed in the approved methodology ACM0002 (version 6). The information provided by the tables includes data, data sources and the underlying calculations.

Table A1. Electricity generation of the Central China Grid in 2003

	Electricity generation (MWh)	**Auxiliary electricity consumption (%)**	**Electricity delivered to the grid (MWh)**
Jiangxi	27165000	6.43	25418291
Henan	95518000	7.68	88182218
Hubei	39532000	3.81	38025831
Hunan	29501000	4.58	28149854
Chongqing	16341000	8.97	14875212
Sichuan	32782000	4.41	31336314
Total			225987719

Data source: China Electric Power Yearbook 2004.

Table A2. Electricity generation of the Central China Grid in 2004

	Electricity generation (MWh)	**Auxiliary electricity consumption (%)**	**Electricity delivered to the grid (MWh)**
Jiangxi	30127000	7.04	28006059
Henan	109352000	8.19	100396071
Hubei	43034000	6.58	40202363
Hunan	37186000	7.47	34408206
Chongqing	16520000	11.06	14692888
Sichuan	34627000	9.41	31368599
Total			249074186

Data source: China Electric Power Yearbook 2005.

Table A3. Electricity generation of the Central China Grid in 2005

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Jiangxi	30000000	6.48	28056000
Henan	131590000	7.32	121957612
Hubei	47700000	2.51	46502730
Hunan	39900000	5	37905000
Chongqing	17584000	8.05	16168488
Sichuan	37202000	4.27	35613475
Total			286203305

Data source: China Electric Power Yearbook 2006.

Table A4. Calculation of simple OM emission factor of the Central China Grid in 2003

Energy	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Total Fuel G=A+B+…+F	Emission factor (tC/TJ) H	Oxidation rate (%) I	NCV (MJ/t or $1000m^3$) J	Emission[82] (tCO_2e) K
Coal	10^4t	1427.41	5504.94	2072.44	1646.47	769.47	2430.93	13851.66	25.8	100	20908	273971539.89
Other washed coal	10^4t	2.03	39.63	0	0	106.12	0	147.78	25.8	100	8363	1169146.40
Coke	10^4t	0	0	0	1.22	0	0	1.22	29.2	100	28435	37142.18
Coke oven gas	10^8m^3	0	0	0.93	0	0	0	0.93	12.1	100	16726	69013.15
Crude oil	10^4t	0	0.5	0.24	0	0	1.2	1.94	20	100	41816	59490.23
Diesel	10^4t	0.52	2.54	0.69	1.21	0.77	0	5.73	20.2	100	42652	181015.94
Fuel oil	10^4t	0.42	0.25	2.17	0.54	0.28	1.2	4.86	21.1	100	41816	157229.00
Refinery gas	10^4t	1.76	6.53	0	0.66	0	0	8.95	15.7	100	46055	237285.34
Nature gas	10^8m^3	0	0	0	0	0.04	2.2	2.24	15.3	100	38931	489222.52
Other energy	10^4tCe	0	11.04	0	0	16.2	0	27.24	0	100	0	0
Total emission of the Central China Grid (tCO_2e)						276371085						

Data sources: China Energy Statistical Yearbook 2004

82 If the unit of the fuel is 10^4 t, then K=G×H×I×J×44/12/10^4; if the unit of the fuel is 10^8 m^3, then K=G×H×I×J×44/12/10^3. The same about the calculation of K in Table A5 and Table A6.

Table A5. Calculation of simple OM emission factor of the Central China Grid in 2004

Energy	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Total Fuel G=A+B+…+F	Emission factor (tC/TJ) H	Oxidation rate (%) I	NCV (MJ/t or 1000m^3) J	Emission (tCO_2e) K
Coal	10^4t	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	17144.1	25.8	100	20908	339092605.29
Cleaned coal	10^4t	0	2.34	0	0	0	0	2.34	25.8	100	26344	58316.13
Other washed coal	10^4t	48.93	104.22	0	0	89.72	0	242.87	25.8	100	8363	1921441.23
Coke	10^4t	0	109.61	0	0	0	0	109.61	29.2	100	28435	3337011.42
Coke oven gas	10^8m^3	0	0	1.68	0	0.34	0	2.02	12.1	100	16726	149899.53
Other gas	10^8m^3	0	0	0	0	2.61	0	2.61	12.1	100	5227	60527.09
Crude oil	10^4t	0	0.86	0.22	0	0	0	1.08	20	100	41816	33118.27
Gasoline	10^4t	0	0.06	0	0	0.01	0	0.07	18.9	100	43070	2089.33
Diesel	10^4t	0.02	3.86	1.7	1.72	1.14	0	8.44	20.2	100	42652	266627.32
Fuel oil	10^4t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.1	100	41816	464893.14
Refinery gas	10^4t	3.52	2.27	0	0	0	0	5.79	15.7	100	46055	153506.38
Nature gas	10^8m^3	0	0	0	0	0	2.27	2.27	15.3	100	38931	495774.61
Other energy	10^4tCe	0	16.92	0	15.2	20.95	0	53.07	0	100	0	0
Total emission of the Central China Grid (tCO_2e)						346035810						

Data sources: China Energy Statistical Yearbook 2005

Table A6. Calculation of simple OM emission factor of the Central China Grid in 2005

Energy	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Total Fuel G=A+B+…+F	Emission factor (tC/TJ) H	Oxidation rate (%) I	NCV (MJ/t or 1000m^3) J	Emission (tCO_2e) K
Coal	10^4t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	17827.75	25.8	100	20908	352614496.76
Cleaned coal	10^4t	0.02	0	0	0	0	0	0.02	25.8	100	26344	498.43
Other washed coal	10^4t	0	138.12	0	0	89.99	0	228.11	25.8	100	8363	1804669.00
Coke	10^4t	0	25.95	0	106.5	0	0	130.95	29.2	100	28435	3986695.05
Coke oven gas	10^8m^3	0	0	1.15	0	0.36	0	1.51	12.1	100	16726	112053.61
Other gas	10^8m^3	0	10.2	0	0	3.12	0	13.32	12.1	100	5227	308896.88
Crude oil	10^4t	0	0.82	0.36	0	0	0	1.18	20	100	41816	36184.78
Gasoline	10^4t	0	0.02	0	0	0.02	0	0.04	18.9	100	43070	1193.90
Diesel	10^4t	1.3	3.03	2.39	1.39	1.38	0	9.49	20.2	100	42652	299797.78
Fuel oil	10^4t	0.64	0.29	3.15	1.68	0.89	2.22	8.87	21.1	100	41816	286959.09
Refinery gas	10^4t	0.71	3.41	1.76	0.78	0	0	6.66	15.7	100	46055	176572.11
Nature gas	10^8m^3	0	0	0	0	0	3	3	15.3	100	38931	655208.73
Other coking products	10^4t	0	0	0	1.5	0	0	1.5	25.8	100	28435	40349.27
Other energy	10^4tCe	0	2.88	0	1.74	32.8	0	37.42	0	100	0	0.00
Total emission of the Central China Grid (tCO_2e)						360323575						

Data sources: China Energy Statistical Yearbook 2006.

Calculate with data provided in Table A1~A6, $EF_{OM,y}$ = (276371085+346035810+360323575) / (225987719+249074186+286203305) = 1.2909 tCO_2e/MWh.

Table A7. Data and result of Step a.

Energy	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Total Fuel G=A+B+…+F	Emission factor (tC/TJ) H	Oxidation Rate I	NCV (MJ/t or $1000m^3$) J	Emission (tCO_2e) K
Coal	10^4t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	17827.75	25.8	100	20908	352,614,497
Cleaned coal	10^4t	0.02	0	0	0	0	0	0.02	25.8	100	26344	498
Other washed coal	10^4t	0	138.12	0	0	89.99	0	228.11	25.8	100	8363	1,804,669
Coke	10^4t	0	25.95	0	106.5	0	0	130.95	29.2	100	28435	3,986,695
Sub-total												**358,406,359**
Crude oil	10^4t	0	0.82	0.36	0	0	0	1.18	20	100	41816	36,185
Gasoline	10^4t	0	0.02	0	0	0.02	0	0.04	18.9	100	43070	1,194
Diesel	10^4t	1.3	3.03	2.39	1.39	1.38	0	9.49	20.2	100	42652	299,798
Fuel oil	10^4t	0.64	0.29	3.15	1.68	0.89	2.22	8.87	21.1	100	41816	286,959
Sub-total												**624,136**
Natural gas	10^7m^3	0	0	0	0	0	3	3	15.3	100	38931	655,209
Coke oven gas	10^7m^3	0	0	1.15	0	0.36	0	1.51	12.1	100	16726	112,054
Other gas	10^7m^3	0	10.2	0	0	3.12	0	13.32	12.1	100	5227	308,897
Refinery gas	10^4t	0.71	3.41	1.76	0.78	0	0	6.66	15.7	100	46055	176,572
Sub-total												**1,252,732**
Total												**360,283,227**

Data sources: China Energy Statistical Yearbook 2006.

Table A8. Emission factor of best technology

	Variable	Electricity supply efficiency	Emission factor of fuel (tC/TJ)	Oxidation rate	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-based power plants	$EF_{Coal,Adv}$	35.82%	25.8	1	0.9508
Gas-based power plants	$EF_{Gas,Adv}$	47.67%	15.3	1	0.4237
Oil-based power plants	$EF_{Oil,Adv}$	47.67%	21.1	1	0.5843

Calculate with data provided in Table A7 and formula (4)~(6), the value for λ_{Coal} is 99.48%, the value for λ_{Oil} is 0.17% and the value for λ_{Gas} is 0.35%.

Therefore $EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =0.9483 tCO_2e/MWh.

Table A9. Installed capacity of the Central China Grid in 2005

	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power (MW)	5906	26267.8	9526.3	7211.6	3759.5	7496	60167.2
Hydro power (MW)	3019	2539.9	8088.9	7905.1	1892.7	14959.6	38405.2
Nuclear power (MW)	0	0	0	0	0	0	0
Wind power and Other (MW)	0	0	0	0	24	0	24
Total (MW)	8925	28807.7	17615.2	15116.7	5676.2	22455.6	98596.4

Data source: China Electric Power Yearbook 2006.

Table A10. Installed capacity of the Central China Grid in 2003

	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power (MW)	5407.8	17635.5	8173.3	6446.7	3126.2	6104	46893.5
Hydro power (MW)	2307.4	2438	7337.2	6603.1	1329.8	12341.5	32357
Nuclear power (MW)	0	0	0	0	0	0	0
Wind power and Other (MW)	0	0	0	0	0	0	0
Total (MW)	7715.2	20073.5	15510.5	13049.8	4456	18445.5	79250.5

Data source: China Electric Power Yearbook 2004.

Table A11. Installed capacity of the Central China Grid in 2002

	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power (MW)	5128.8	15904.5	8147.8	4975.6	3004.5	6142	43303.2
Hydro power (MW)	2197.4	2438	7213.9	6135.3	1195.5	11854.6	31034.7
Nuclear power (MW)	0	0	0	0	0	0	0
Wind power and Other (MW)	0	0	0	0	0	0	0
Total (MW)	7326.2	18342.5	15361.7	11110.9	4200	17996.6	74337.9

Data source: China Electric Power Yearbook 2003.

Table A12. Calculation of generation capacity additions of the Central China Grid

	Installed capacity in 2002 (MW) A	Installed capacity in 2003 (MW) B	Installed capacity in 2005 (MW) C	Capacity additions from 2002 to 2005 (MW) D=C-A	Share in total capacity additions
Thermal power	43303.2	46893.5	60167.2	16864	69.52%
Hydro power	31034.7	32357	38405.2	7370.5	30.38%
Nuclear power	0	0	0	0	0.00%
Wind power and Other	0	0	24	24	0.10%
Total	74337.9	79250.5	98596.4	24258.5	100.00%
Share in total installed capacity of 2005	75.40%	80.38%	100%		

$EF_{BM,y}$ =0.9483×69.52%=0.6592 tCO_2e/MWh.

Table A13. Share of low-cost/must run resources in the Central China Grid

	2001	2002	2003	2004	2005
Thermal power (GWh)	178156	200347	240839	270846	303976
Hydro power (GWh)	103554	112440	117848	129934	187734
Wind power and Other (GWh)	0	0	0	725	10
Total (GWh)	281712	312788	358689	401505	491720
Share of low-cost/must run resources (%)	36.76	35.95	32.86	32.36	38.18

Data source: China Electric Power Yearbook 2002 (P617), 2003 (P585), 2004 (P709), 2005 (P474) and 2006 (568).

Annex 4

MONITORING INFORMATION

The calibration of meters & metering, the QA/QC procedure and others of the monitoring plan should be carried out with reference to the Supply Agreement of High Voltage Electricity, the Water and Fuel Gas Supply Agreement and the checking and testing standard and the specification of the monitoring equipments. No other additional information.

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